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ABSTRACT

Usable data about human resources in the economy are fundamentally important, but present methods of obtaining, organizing, and using such information are increasingly unsatisfactory. The application of electronic data processing to manpower and social concerns should be improved and increased. This could stimulate closer exchange between government, institutions, and business enterprises in the collection and dissemination of manpower data. The first phase of the study was a broad-scope questionnaire of 38 companies in Austria, France, Germany, Great Britain, Sweden, and Switzerland which have developed, or are planning to develop, computer-based personnel information systems. The second phase consisted of depth study of eight of the companies. Case study investigations were concerned with the content and function of the system and with the administrative and personnel consequences of the introduction of such systems. A set of key points which emerged from the study is developed. A model demonstrates the need for coordination to increase communication vertically and horizontally. The questionnaires used and statistics analyzed are included. (MS)

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THE DEVELOPMENT OF **electronic data processing** IN MANPOWER AREAS

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THE DEVELOPMENT OF
ELECTRONIC DATA PROCESSING
in
MANPOWER AREAS

(A comparative study of personnel information
systems and their implications in six
European Countries)

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PREFACE

The Development of Electronic Data Processing in Manpower Areas (A comparative Study of Personnel Information Systems and their implications in six European countries).

The report that follows describes events occurring at the initiative of the O.E.C.D. that culminated in an in depth study of select companies in Austria, France, Germany, Great Britain, Sweden and Switzerland who have developed or are planning to develop, computer based personnel information systems. The report also describes the study itself and attempts to examine the results therefrom in a way that will benefit government bodies who are engaged in national planning in manpower areas; institutions such as employers' associations similarly engaged; companies who are currently planning the introduction of such systems; and companies, such as the participants, who wish to exchange information and ideas that will enhance the viability of their existing systems.

Although the study itself does not investigate the needs of national bodies in the collection of manpower data as such, we have included a discussion of these problems (see Chapter I) with a view to stimulating a closer exchange between government, institutions, and business enterprises to overcome or minimise the problems surrounding the interface between these organisations in the collection and dissemination of manpower data.

The editors are grateful for the cooperation and time given by participating companies to the investigators of the study and hope they may find the results as useful to themselves as to others who may benefit. They would also like to thank Mr. Linder and his colleagues of the Swedish Council for Personnel Administration and Dr. Bartelt of the D.G.F.P. (German Institute of Personnel Management) for their invaluable contributions to the work.

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CHAPTER I

INTRODUCTION - Manpower Information: The need for Mutual Aid

BY: A. Hersleb and
E. Kempf

THE UNDERLYING PURPOSE

The aim of this introductory paper is to place the reported investigation and case studies of employer systems in their wider context rather than to review their specific contents and findings - this will be done in the body of the report. Nor is it the intention to write an essay on theories of manpower classification, to discuss the specifics of computer applications and system operation, or to produce a design-study for a manpower information system. This preliminary section of the report is introductory in the sense that it attempts to illuminate the background needs and ideas commonly encountered at both macro and micro levels in regard to manpower information and its collection, processing and uses. In doing so it will try to make as concrete as possible by example the sort of problems which people come up against and the issues which have to be faced in seeking systematic and sensible ways of improving our common knowledge, overcoming novel and challenging difficulties, and meeting clearly defined and essential wants with utility and economy, and without causing administrative chaos or endangering the essential responsibilities and liberties of others in the process. The underlying conclusion and message emerging from the whole report is that this is a novel area in which knowledge and experience are being gained very rapidly and that we can all learn from and help each other. The report originates from an appreciation of this, gained from encounters with essentially the same problems concerning manpower data in many other OECD studies and situation reports, and from OECD's desire to promote this mutual-aid quickly and pragmatically in order to help practical men in authority overcome urgent and growing problems in sensible and efficient ways within the limitations of present knowledge and of what is possible. It is thus less concerned with what ought to be than with what can be.

The need for common understanding and effective action in this general area is indeed becoming urgent. This introductory section hopes to emphasise this, and to show that although the subject of the report is that of the application of the computer to manpower information and its uses within enterprise, this and the similar studies which are needed in the manpower area are of wider significance to society as a whole and of particular relevance to the problems of governments and to informed and effective macro and intermediate level administration in general. Usable data about human resources in the economy and in its constituent employing organisations is fundamentally and increasingly important; so is knowledge about people as citizens and consumers of administrative services; so, equally, is the counterflow of information to organisations and employees and citizens.

This is why OECD commissioned the enquiry in the first place - not to get personnel managers interested in computerised records and manpower planning (useful though this may be), but to get across to all in government and industry and other concerned institutions that present ways of obtaining, organising and using information about human resources are increasingly unsatisfactory and inadequate. It is beginning to be widely recognised that the application of electronics to statistical data, methods, and communication has the capacity now to transform the resources and methods of administration. This is not least the case in the area of manpower.

BACKGROUND CONSIDERATIONS

Computers and their applications are still in their infancy, although already having a marked impact on human affairs. Their powerful potential for affecting the whole quality, scope and progress of industrial civilisation probably rivals that of the harnessing of steam to machines. Although the specialised workers involved understand them and appreciate their significance, not many others do as yet. It must be a matter of concern that few people who carry high responsibility for the direction of affairs at national, intermediate and enterprise levels appreciate the ability of these new techniques to transform administration. That they can do so is because administration depends upon efficient, rapid, economical, accurate, coherent, consistent and co-ordinated acquisition of data and upon analysis, forecasting and communication of resulting information in an age of increasing complexity and inter-dependence of organised human activity and knowledge. Problems previously insoluble can be unlocked; projects previously impracticable embarked upon; but the key is less the detailed know-how of experts than the general understanding and willingness to act and apply these new powerful aids to social and economic progress on the part of those who administer and direct society and its institutions. It is to these as much as to computer experts, manpower planners or personnel managers that this study is directed.

In the application of electronic data processing we seem to be further ahead in scientific, mathematical, financial and accounting fields than in human fields. The Manpower & Social Affairs Directorate of OECD has in project after project come across difficulties in the fundamental matter of collecting, analysing and making known in a systematic way to those who need it, apparently simple basic data about human beings in society and particularly in the economy. There is no doubt that statistics about people and ways of collecting, processing and using such statistics are poor at all levels, and especially for macro purposes, in country after country.

This is partly a function of the rapid growth in the complexity and interdependence of societies - of organisations and activities in our civilisation as a whole. This acceleration appears rapidly to be outstripping the capacity to respond of institutionalised and thus inertia-prone traditional modes and means of providing information for decision-making and control of events. To this extent these new computing and communicating technologies are appearing just in time, it would seem, to forestall a general silting-up and entropy of the processes of administration in society at all levels with consequent confusion, disorder, dissatisfaction and wastage.

It is also a function, it is suggested, of the inherent and fundamental complexity of the grassroots entities in society - of individual human beings and their immediate inter-personal relationships in the home and workplace. People are complex creatures and an increasing number of their characteristics become of interest to society as the latter itself becomes more complex. Such relationships and the resulting data requirements, under various characteristics, of people in their social and economic roles in an increasingly sophisticated society are multiplying alarmingly, and require equally sophisticated means of coping with them. Nobody is yet doing this very well - hence OECD's high interest in this whole broad area as a necessary and rewarding one for study and urgent action. However, it would seem from general contacts and knowledge that on the whole it is the large employers who are making the most progress in using these new facilities and methods in manpower applications (and here can be included governments and government agencies in their role of large employers rather than as administrators and managers of society as a whole). It is suggested that this is probably because:

a. there is sufficient organisational and administrative complexity in large employing entities to stimulate innovative solutions to problems which are difficult enough to be challenging without being completely insoluble.

b. employers are by definition closest to the grassroots data and need more of it, and covering more human characteristics, than does government either for general or for specialised departmental purposes. Even small employers cope successfully with complex detail in organised and systematic ways in their payroll administration and know far more about their employees than any government department or conceivable combination of departments could ever hope to, or indeed need to.

c. big employers need and can afford access to computers for general business purposes and their use in manpower areas is a natural extension: stimulated further by increased emphasis on career development, sophisticated payment systems, manpower cost-effectiveness, manpower planning, etc. and a generally more numerate approach to personnel management than in the past.

Thus the pioneering experiences, in this area, of large employers must be of real and immediate significance and interest not just to other large employers but to national administrations equally. (They will be of less immediate interest to small employers, whose use of such methods must await advances in the technology and economics of computing and communications facilities). It is at macro levels where the most severe problems of manpower information and planning appear to lie, as most of the case studies which follow indeed confirm, as seen from below by firms in their dealings with government.

Concerning manpower information we thus have a background of increasingly sophisticated and integrated societies whose citizens' demands for security, income, education, work, leisure and entertainment, information, participation etc. etc., and the associated economic growth and social consequences, require for the direction of affairs more information, and in more complex and accurate forms, about people both collectively and individually. These needs for human data and particularly in economic aspects - manpower data - are felt at government level, at the rapidly - proliferating intermediate level of both government and independent agencies, boards, associations etc., and at micro level within enterprises and institutions.

These requirements at all three levels have emerged in parallel with the rapid expansion of the application of EDP and its capacities to treat data. The potential for the use of such data generated by the application of EDP has thus increased considerably. Initiatives to wider use of this potential have been taken at all three levels, but there are too few signs that this is part of any integrated national or even institutional policy. This is particularly visible from the level of the enterprise.

THE GENERAL APPROACH

The macro and the micro aspects of applying EDP in manpower areas are two sides of the same coin. The broad issues and problems in each will be lightly sketched-in in the remainder of this introductory section. The appended link-paper concerned with some general manpower information problems in one OECD country further illuminates the macro-problem and hopefully may serve to point up the need for similar detailed investigatory surveys and case studies at the macro level to the one this pilot project attempts at the micro level. The main body of this publication contains the detail of this micro-level survey and its conclusions.

This study is not, of course, unique: there have been other investigations by observers into the development of personnel information systems. In recent years the most notable of these studies of which we are aware are: "Developing Computer-based Employee Information Systems," by E.J. Morrison, published by The American Management Association as AMA Research Study 99, in 1969; and, "Personnel Records and the Computer - A Survey" by Joan Springall, published jointly by the Institute of Personnel Management and the Industrial Society in the U.K. in 1971.

The American Study was to an extent more complete in that it consisted of a questionnaire to a disproportional stratified sample to select 900 companies at random within a certain size (employing power) whether or not they were known to be engaged in the activities of computer based personnel information systems. The questionnaire was followed by in-depth case study type interviewing of 18 respondents. Three things of interest emerge in comparing the AMA and OECD studies:

1) Although the American study pre-dates this investigation by almost two years, the general interpretations and conclusions of the OECD study are largely in accord with the American ones. In other words two years of experience have not altered significantly the main problems and considerations. The only discernible difference is that of some increase in sophistication.

2) The general methodology is almost identical although when this study was being planned and conducted the investigators were not aware of the AMA study.

3) The main difference of approach was participant selection - i.e. determination of the sample. This OECD study concentrated on known or planned applications, whereas the AMA study sample was random selection based on company size.

The British IPM/IS Study in some ways complements this present study. The investigations were conducted at the same time - and known to be so by the investigators of this study; both studies are a biased sample in that all participants were known to be engaged in these activities. The difference is the greater comprehensiveness of the OECD questionnaire (this distinction applies to both the AMA and IPM study) and the fact that this OECD study embraced companies who were known to be in the planning stage without real experience.

Of the two others, the AMA study is the best, not only in terms of coverage but in terms of understanding the dynamic of personnel information systems. The British study tends to be superficial in its treatment of the subject matter and some of the conclusions reached are not supported by evidence reported. Nonetheless both should be read by managers contemplating computer-based personnel systems.

This present study is different in two aspects. Firstly, it is probably the first attempt to look at computer-based personnel information systems internationally with the aim of obtaining a better understanding of underlying concepts and philosophies behind such systems rather than an attempt to inventory the kind and type of data contained within such a system. It thus attempts to ask "why?" as well as "what?". Secondly, this study attempts to relate some of the underlying problems of structure and use to external demands upon domestic systems, whether computer-based or not, and thus links with macro aspects of this field of enquiry.

It may be thought, indeed, that both too much and too little has been attempted in this report as regards the content, and that as regards the presentation it may fall between two stools in addressing itself both to the high-level minister, administrator or director and also to different kinds of expert such as computer specialists, statisticians, personnel managers and manpower planners. However, this is very much a pilot project in an area of great importance and wide interest where patently too little is known by anyone. Those concerned with the study - whether OECD personnel or participating experts - are of the opinion that it will have wide interest and relevance at several levels and that it was important to take a first few steps and publish the results while they were still of relevance rather than attempt an over-elaborate, specialised and lengthy exercise in such comparatively unexplored terrain at both government and enterprise level. If it does no more than arouse interest and awareness in common problems and possible solutions and lines of convergence, and provides some exploratory first few steps and a foundation and stimulus for more detailed work and progress, then all concerned will be well satisfied.

Since this report on the investigation, and in particular this introductory chapter linking government and enterprise interests in this field, is addressed as much to politicians, administrators, economists and managers as to specialists in manpower planning and E.D.P. systems, some brief explanation of the terminology and concepts commonly employed by those immersed in these activities has been included in this introduction. However, the general intent of this whole study, and the tenor of this particular chapter, is strongly utilitarian rather than theoretical and is directed towards obtaining effective and urgent co-operation and action (and incidentally towards reducing the successive racapitulations of the difficulties and errors of pioneers that to date has been a frequent and unfortunate feature of this new field of activity).

MACRO MICRO NEEDS & CONVENIENCES

It was observed above that the rapid acceleration of change and increase in complexity of our advanced societies, the enlarging boundaries and uses of knowledge, and the increasing inter-dependence and inter-penetration of all aspects of civilisation makes it harder all the time for governments to govern. To do so they must measure change, maintain control, anticipate, and thus shape the present and the future. This requires information. This information as regards manpower, i.e. citizens in their socio-economic aspects affecting government, is on the whole inadequate and poorly organised in most countries.

Such is the pace of events that these disadvantages will become worse unless tackled in a timely and well organised fashion.

There are strong parallels here with large firms, as will be seen. Traditional compartmentalisations in national administrations and the real difficulty of changing specialised systems and institutionalised routines and the patterns of information flows within and between them are at the root of many of the difficulties. These are only too easily underestimated by those not in the public service. It is relatively easy to determine needs and specify solutions on a clean-slate basis but in practice we usually have to try to do the best we can within our existing network of separate statistical systems of varying age and utility.

Such obstacles are hard enough to overcome in private firms with their traditional systems and relatively compact, even if complicated, organisational structures. Improvement and innovation is harder at macro and intermediate levels. Nevertheless the computer, once installed, both permits and demands for its efficient use a common language and approach transcending physical and conceptual boundaries and uniting organisational entities and levels. Its installation is usually a cleansing and therapeutic process even if initially it is only used to duplicate what was there before. However, many large employers (including government institutions in an employing role) have already passed through this phase successfully and under the pressures of need have used the computer as a basis for developing solutions to problems of intelligence about manpower which (allowing for detailed differences of environment and need) are remarkably similar in their broad contents, structures and applications. The problems of the firms in this present survey, and the way they think about and tackle them, seem much the same irrespective of industry or nationality. Their systems are built from the same material - those relatively few characteristics of humanity of relevance to the organisation and administration of people for common purposes. (To which extent it is unfortunate that so many firms should appear to be "inventing the steam-engine" all over again in isolation from each other - hence one of the purposes of this publication).

Such employers are thus all developing and using manpower systems very similarly to describe the employee both in his own personal characteristics and in his aspects which relate to and interpenetrate with the enterprise, i.e. as an individual and as an organisational constituent and economic input. They are doing so, and using the resulting information, in ways which would not have been possible before the introduction of electronic data processing and transmittal technology, and no doubt we shall see rapid developments in such systems and their adoption by smaller firms as technology, software and economics improve. These developments permit data to be handled in complex permutations of characteristics derived from large populations.

These firms appear to feel that governments in their administrative as opposed to employing role are not matching, in manpower areas, the progress of large employers; are not co-operating sufficiently at their mutual interfaces nor putting themselves in a position to use efficiently for the common good manpower data that exists or is potentially available; and further that governments' out-of-date methods of data acquisition are putting increasingly unnecessary and growing burdens on both employers and citizens.

Such feelings are understandable,if unfair to varying degrees. To an outsider it may appear ridiculously timid, short-sighted and disorganised not to carry through immediately this or that measure which will obviously produce administrative simplifications, economies, and better information, and which depends only on available technologies, and well-tested methodologies. Such viewpoints naively under-estimate the political, organisational and human obstacles that have in practice to be negotiated. For one thing, existing information structures and flows have a strong inertial staying-power and inbuilt needs, uses, loyalties, and routines which will not be lightly sacrificed. For another, administration is necessarily departmentalised and complicated, and while it is obviously feasible in principle to construct a common data system serving common purposes (in this case manpower data) across departments, there is seldom a group of administrators so centrally and highly placed as both to be able to perceive such common needs and opportunities and to be able to get something done about them. Politicians, too, may be less than enthusiastic both because of the initial expense and the extended lead-times involved (and the difficulty of getting civil servants to agree together) and also because of the third major point - that there may be very real political difficulties and disturbing moral issues involved.

Indeed, to the ordinary voter computers are "ju-ju" - black magic manipulated by arid technocrats and too much knowledge means too much power (not least fiscal power, in our over-taxed societies). The man in the street associates the growing complexities of his environment with bureaucracy and soulless science and technology, and the equation: bureaucrat + computer + statistician + information system is never going to cause the citizens to dance with joy in the streets.

Fortunately we are in no position to create a Frankenstein's Monster for ourselves of some total government human information system containing every conceivable if unpleasant fact about every citizen - bad debts, unofficial wives and children, criminal record etc! Nevertheless all concerned in this field need a sensitive and humble awareness that there are real truths and dangers underlying the often ill-informed and inarticulate attitudes of citizens in these matters, and the hesitations and apprehensions of politicians and experienced senior administrators. Such systems do have the potential to turn human administration into human manipulations. They are tools only, maybe, but powerful and double-edged. They must be used with wisdom, humility and charity to serve men, not to enslave them.

However, it is quite unrealistic to go from one extreme to another and to paralyse all action in consequence. There is a middle way along which to proceed with prudence and foresight to produce common good without individual loss or the need for vast risks and expenditures. There is in fact a sort of scale of cost advantage, in the first degrees of which comparatively cheap, simple steps taken now can produce a useful proportion of the potential gains from manpower systems. From this point of departure more comprehensive measures can gain much of the remaining advantage (provided the initial steps are planned with these further steps in mind, otherwise they may be made more difficult). Beyond this there must be some kind of breakeven point, which will advance up the scale as knowledge resources improve, beyond which investment brings diminishing returns.

We are concerned here and now only with what clearly will bring a pay-off, and in the present state of the art we must use the novel advantages now available somewhat pragmatically with due regard to practicability and with as much foresight and knowledge as we can muster. Right now we need as much interchange of experience as we can get - between governments, between departments and between firms; vertically between these levels; between systems users and systems designers; between specialisms and disciplines; between data suppliers and data users. Large integrated governmental pay and personnel systems covering all departments such as that discussed in the British Civil Service case study are important in this connection since their design, construction and operation require precisely these contacts and mutual learning experiences across vertical and horizontal boundaries within government, and give administrators insights into the wider potentialities of computerised systems for manpower purposes. Opportunities and forums for such discussions need to be extended both internationally, where OECD is playing an important role, and within individual countries. Fortunately this is beginning to happen.

The profitable and practicable initial steps and investigations that should be underway now are, it is suggested, the following :-

1. To obtain reasonable consistency in methods of collecting, classifying, analysing and reporting data about the most readily useful characteristics of people which can be treated in commonly agreed ways for non-specialised purposes. These need to be kept strictly to the bare minimum essential. This requires investigation of such needs at all levels.

2. To anticipate, and jointly co-operate in finding solutions to, difficulties inherent in certain data

fields, which may be encountered as a result of Step 1. The biggest problems would seem to arise with two classes of data - Locational and Occupational - and much work and co-operation is required to resolve these satisfactorily. Unless solutions are found for these there will be little further progress - they are absolutely crucial.

3. To examine and solve problems regarding the flows of information about manpower between and across macro-intermediate-micro levels. Investigations at the specialised intermediate linkage points of communication are likely to be particularly rewarding.

The manpower systems of employing organisations such as those investigated in this study have in many cases already passed through the steps outlined above and reached a stage of evolution which most administrations will not find easy to achieve. The lessons they have learned in the process should be of value to governments and their agencies. The remainder of this paper will look more closely at what is involved in steps 1-3 above, and will then attempt to look beyond them in the light of employer's experiences and solutions. It will not attempt to do so comprehensively nor from a theoretical viewpoint, but will concentrate on the most essential issues and key questions which have to be faced in solving what are highly practical and important problems. However, since this is addressed to a wider audience than manpower planners and systems analysts, some brief treatment of background concepts is necessary as an introduction to essential discussion on three vital aspects of manpower information with which everyone concerned with manpower systems in large employing organisations has had to struggle. These are:

1. The identification and unified treatment of the essential data categories for common use and in interlocking ways.

2. The treatment of locational characteristics.

3. The treatment of occupational characteristics.

LEVELS AND TYPES OF INFORMATION

In relating the problems and needs of employing organisations to those of government and of intermediate institutions we must look at the total national picture and distinguish the requirement levels at which information is needed, the purposes which require and apply it, and the types of data and level of aggregation demanded by such needs. Such factors can only be outlined lightly here, to sketch-in the broad field of investigation that is needed and to highlight what would appear to be one or two curcial areas requiring priority. The outline below would seem to be a useful analytical approach.

1. Macro Level: Cabinet and one or two key central departments and inter-departmental agencies (such as central statistical and research organisations).

Purpose: central policy formulation, decision-making and prediction in socio-economic areas, e.g. industrial relations, management of demand, wage inflation, migration, labour market and training policies, educational investment, promotion of scientific research, etc. Data: generally highly-aggregated. Occasionally gathered directly from grass-roots (national demographic census, specially commissioned sample surveys). Vast preponderance flowing via intermediate levels.

II. Macro-Intermediate: Government departments with specialised functions, Regional and Local Government, official or independent Boards, Agencies, Institutions, Employer and Sector Associations, Professional Bodies, Trade Unions, the main Branches of the Armed Services, Police, etc. Purpose: specialised, sectionalised, localised and specific. Examples: national and local tax administration; social security; welfare and housing services; health and education administration; public and semi-public placement and unemployment and training services; penal,judicial, protective and defence services etc.; also mutualised collective interests, e.g. national and sector collective bargaining and wages boards, examination boards, etc. Data: both aggregated and individual, concerning both economically active and non-active populations, and roles as general citizens and householders and as e.g. employees, proprietors, self-employed, students, patients, infants, housewives, parents, pensioners, taxpayers, soldiers etc. etc. and their associated characteristics and organisational affiliations. Data drawn from level III - both individual and collective - primarily for administrative purposes.

III. Micro-Level: For this purpose, institutions and organisations in direct contact and relationship with the appropriate grass-roots individuals in both the general population and in particular sub-populations of different kinds within it. Thus: medical services and hospitals - patients; local government - citizens; localised organs of national administration - citizens; employers - employees; schools - pupils; prisons - prisoners; trade unions - members; etc. etc. Thus a variety of purposes and needs. Data: essential feature is immediate administration of organised human activities and generation of rich and voluminous data about people held in systematic and specialised ways, aggregated and reported upwards to Level II (and thus indirectly to Level I) often with a Level II requirement for data not specifically needed, or in forms not needed, at Level III.

A matter of prime importance is that at Level III the closeness of contact with the ultimate "grass-roots" data source - the individual citizen in his variously appropriate roles - and the operational nature, and frequently the continuity, of such contact mean that data at this level are nearly always the most accurate and verifiable, if frequently complex and highly - specialised in purpose. The number and variety of various species and sizes of organisation at this level mean that this "grass-roots" data is held in thousands of individual systems, mostly manual, and varying widely in content, structure and sophistication. The majority, and covering the largest total population, are payroll systems.

Two further important points are that:

1. while any one of the more specialised micro-organisations may only require one or two communication channels upward to Level II organisations, involving in each case a common Level II - Level III "language", others - and particularly enterprises - are obliged to use a number of different channels and "languages" and frequencies of reporting because of their widespread operation and corporate and functional inter-connections with higher levels, and :

2. - which ties in with 1) - that employing organisations have a domestic need for more volume of information about more characteristics of people than do most other micro-organisations (and a large proportion of each national population are indeed employees). They are followed in importance and numbers, perhaps, by educational institutions and their inmates.

Employees and young people in education thus together form a very substantial proportion of the total population and embody data which are of the greatest significance and most frequent use at macro-level insofar as human aspects of society and the economy are concerned.

THE STRUCTURE OF DATA

Finally, to complete this brief analytical framework, the kinds of data which are required should be considered. These emerge from the common basic characteristics of human beings and from their relationships with society as individuals and when organised into groups for common activities and purposes. Four broad classes of data about people may perhaps be accepted for the present purpose: personal/administrative; locational; occupational; and qualificational. These four classes appear in the information requirements at Macro, Intermediate and Micro levels, though for any one specific purpose it may be that only one is needed, or perhaps combinations of two, three or all four, as the case may be. The widest requirements occur at the two ends of the spectrum - for broad government purposes and especially among employers.

Two basic "dimensions", which may be described figuratively as horizontal (category) and vertical (level), can also be distinguished within all these four classes. This forms another plane, as it were, in the conceptual apparatus of data classification. Their differences may perhaps best be apprehended by the rather sketchy tabulation below which will save much tedious narrative explanation.

(In parenthesis, there appears to be a great need for systematising terminology in this general area where in English, at least, manpower planners, systems analysts and taxonomists cannot even seem to speak a common language, let alone create one! As in most growing areas of activity words with hitherto specific meanings are being used in new ways, and differently by different kinds of people, e.g. axis, field, parameter, dimension, variable- and the confusion needs sorting out).

Thus in addition to the four main classes reflecting content and usage, there are the two basic structural concepts of category (horizontal) and level (vertical).

STRUCTURE OF DATA

CATEGORY (Horizontal Concept)	LEVEL (Vertical Concept)
Category,area,field, (not in the same sense as computer system "field"), extension collection.	Level,range, dimension, spectrum, number, degree, scale.
Observation	Measurement
Nominal,descriptive	Relational, explanatory
Classification by arrays of similarity at successively higher and broader levels of such similarities.	Classification by number,by ordered sequences, degrees, of amount of quantity or quality characteristic.

EXAMPLES

Personal/Administrative

Name	Age	Performance	Hourly Income
Smith, Hansen,Braun,Duval etc. (few kinds of "horizontal" data in this Class)	41-50	High	$23
	31-40	Average	$24
	21-30	Poor	$25

Locational

Region A,Region B,Region C etc.	Director Level	(few kinds of "vertical" data in this Class)
Industry: Steel,Coal,Shipbuilding,etc.	1 level below Directors	
Function: Finance,Production, Research etc.	2 levels below Directors	

Occupational

Designing,estimating, controlling, etc. Welding,pipefitting, erecting, machining etc.	Director	General	Technician
	Manager	Colonel	Craftsman
	Super/visor	Lieutenant	Operator
	Practitioner	Cadet	Helper/Labourer

Qualificational

Engineering: Civil, mechanical, etc. Art: music, drama, literature, etc.	Higher degree Pass Degree College Entrance School Certificate	Final Professional Intermediate Professional Student Professional Craft Certificate

(There is also, of course, the third dimension of Time, represented in systems by the dating of events corresponding to Horizontal or Vertical data).

In general it may be taken that there are fewer problems of data classification by category than by level. Of course, categories such as Job Knowledge or Job Activity may contain so much detail or interpenetrate so closely with other category fields that a choice must be made between a number of different ways, all perhaps equally valid in principle, of grouping similarities and arranging them in hierarchies. There is no "best way", but a reasonable optimal solution may be arrived at and agreed by considering such factors as: appropriateness to end-purpose; existing and familiar classifications of the same characteristic; statistical continuity; compatibility and inter-connections with closely-related if different characteristic classifications; degree of discrimination or aggregation required; capacity for future expansion or for interpolation of new items; limitations or opportunities arising from hardware or software considerations; familiarity or capacity of respondents (at data input end) with regard to probable terminology, concepts and structure; etc. etc.

However, it is the vertical or level components of classification that in practice raise the most difficulties - difficulties of choice and judgement. The large element of judgement in level characteristics must always be born in mind and will enter strongly into system design - which, however, must when completed involve the respondents - the preparers and inputters of data about people - in as little judgement as possible, as opposed to measurement of objective and observable characteristics.

In some cases a consensus has long been established, e.g. army ranks and their correspondence with ranks in the other armed forces. In others, the basic data itself presents no problems though the establishment of common conventions for its vertical ordering may. Thus birthdates arrange themselves naturally in temporal sequence, but for many purposes they need to be grouped into bands and the need for choice then emerges, e.g. 5 year to 10 year bands? 21-25, 26-30, or 20-24, 25-29? It is essential to establish standards of greatest common utility for such matters, otherwise inconvenience, incompatibilities in information emerging from different administrative entities at intermediate level, and ultimate statistical chaos, will result.

The greatest element of judgement arises when behavioural factors are built into manpower systems, which is not uncommon at the enterprise level. Some domestic manpower systems use codes reflecting judgements of varying complexity, objectivity and validity in regard to e.g. performance, skill, promotability, ultimate potential, eligibility for special management development or salary treatment, etc. Similarly the occupational classifications of domestic systems may be based on highly sophisticated job analysis, time and motion studies, job evaluation schemes, personality and intelligence test batteries, etc. These may be acceptable in individual domestic applications where they will reflect a particular managerial culture which is presumably understood by those immersed in it and gives a common framework of reference for application of these system components. Such techniques and judgements may then produce information with some meaning and utility to those concerned. For any higher-level system, however, they would seem to be fraught with complication and misunderstanding. A golden rule, it is suggested, is that no common information system should contain terminologies, concepts and classifications which are not commonly understood and used by the respondents who are going to supply it and the administrators who are going to apply it. (Many would argue, for example, that much of the conceptual apparatus of the American D.O.T. system adds great complication for very marginal utility and is of doubtful validity at best).

Given this, there remains two inferential level characteristics whose general usefulness and wide applicability outweigh the difficulties involved in arriving at level definitions which are generally acceptable and involve a minimum of choice and judgement on the part of respondents.

Firstly, there is the concept - closely tied to occupational function - of Level of Responsibility/ authority in work. There is usually (though not always!) a good consensus within an organisation on the differences between a director, a manager, a supervisor, a practitioner (a worker of any kind or status without supervisory responsibilities), and a trainee. (There are frequently, nevertheless, acute difficulties in distinguishing and defining satisfactorily the interface between "supervisor" and "practitioner", particularly when "work leaders" hover uneasily within the misty interface!) To obtain equal consensus across independent organisations so that like is indisputably being compared with like is very much harder. Yet such judgements are required for so many essential purposes that the use of such a scale is quite unavoidable. Experience in practice suggests that a reasonable working compromise which does produce useful information at the expense of some tolerable inaccuracy is in fact obtainable, providing that the level scale is kept brutally simple and does not attempt to make fine differentiations and providing that the definitions are written very carefully in everyday language with the practical realities of working life very much in mind.

The second area of possible difficulty is that of Qualification Level. This may be no problem in some countries, but in the U.K. for example there are a number of parallel qualificational hierarchies and a wealth of academic, professional and vocational qualifications of varying degrees of "respectability" and recognition. Some clear paths have been hacked through the British qualificational jungle in recent years, but employers in particular would welcome more guidance as regards compatibilities and correspondences (at present each has to construct his own). Again, a Qualification Level classification is a fundamental need in any common system and in countries such as the U.K. the nettle will have to be grasped in spite of the obvious embarrassments involved. The problem is worse as regards international correspondence, though there are signs that some progress is being made.

To sum up, level classifications should be kept separate in coding structures from category classifications (e.g. in classifying broadly - occupational characteristics) and should be most carefully defined in ways comprehensible and familiar to the people who may be expected in practice to assemble and input data to higher-level systems. A sound working principle is that as high a degree of commonality of concept and experience and as little inferentiality and latitude for judgement as possible should be required, even at the sacrifice of some statistical purity.

THE IMPORTANCE OF PRACTICAL SIMPLICITY

As regards manpower systems as a whole, the need for pragmatic simplicity and comprehensibility together with self-revealing structural logic and consistency, the use of concrete every-day language and familiar concepts, and a low level of inference in practice - these cannot be stressed too often. If, to gain the highest theoretical measure of accuracy and discrimination very complex and lengthy structures employing abstruse theoretical concepts and intellectually abstract vocabularies are employed, the actual results are likely to be very disappointing and the opposite of what is intended. In practice the resulting system is likely to be misunderstood and misapplied. It will give ordinary respondents and users no comforting and familiar landmarks by which to allocate people to characteristic fields and to navigate through the structure, and data will finish up in the wrong cells if indeed it is not simply "invented" or withheld.

For example, a string of abstractions describing various characteristics of work, organisation and knowledge is no substitute for an occupational descriptor such as "chef" which, while not impeccably accurate in all conceivable situations, does give some immediate clue to the nature of the work, is tolerably accurate for most imaginable common purposes, and is referrable anyway to a strictly defined description. For specialist purposes such as catering industry training schemes or sophisticated aspects of hotel management the descriptor "chef" may well need to be qualified in various ways, but we are now discussing common-purpose applications - to which such specialist organisations will also need to contribute, incidentally.

Similarly the relationship, in the measurement of manpower by Organisation Function, between category & level of organisation-function is very complicated and can have dramatic effects on resulting statistics if not carefully handled and defined. It involves such difficulties within large autonomous micro organisations that, while incontrovertably desirable in theory as a separate component of a common system, it would in practice be folly to attempt it. It would never be understood and applied consistently by respondents and to get even poor consistency would involve the framing of unacceptably complicated rules. It will be hard enough to get acceptable consistency in the treatment of the organisation-function component in Standard Industrial Classifications (discussed further below).

All this is not to say that data submissions are prepared by factory-sweepers and office boys - just that they are not prepared by professors of logic or econometricians or demographic statisticians. The temptation to construct idealised systems must be avoided, or the actual results may only prove that the designers are clever fools. It is better to take one safe step at a time than to run and fall over. Thus it is necessary continually to bear in mind the most essential only of end-purposes; the constraining realities at the input-end; the actual practical availability of data; the possibilities of building upon and incorporating what we already have which if useful is then also familiar and gives statistical continuity; the need to design-in flexibility and capacity for growth, change and increasing know-how; and the need for mutual consistency between the various fields of manpower data to be incorporated.

POSTS & PERSONS

The issues involved in post/person (job/employee) systems and indeed the wider aspects of the treatment of positional as opposed to person-oriented characteristics in any manpower system are important enough to warrant some brief discussion.

Post/person designs maintain two parallel information systems with a wide overlap of similar or identical characteristic-fields, one describing and counting the population of recognised posts (the "establishment" - here not used in the sense of workplace) by characteristics derived from job-analysis and related techniques, the other describing and counting the corresponding population of incumbents by characteristics appertaining to people. Comparison between the two then reveals mismatches of various kinds requiring appropriate adjustments e.g. in management development, job training, compensation etc. Perhaps most frequently placements (hires and internal mobility) and possibly dismissals are the outcome, and the post/person system may then automatically generate "vacancies" and corresponding job-specifications. Such dual-systems are highly logical (if sometimes unrealistic in practical terms)and may be very useful in organisational cultures which suit them, but they are certainly expensive and complicated and the whole approach raises interesting issues. They are so tidily logical that many may immediately think of them for purposes which cross autonomous enterprises, e.g. on a national scale. This may be particularly true of those accustomed to operate within environments in which the "Establishment" concepts as a means of modelling and controlling reality is the norm. This approach,however, is in fact not so widespread and may be unsuited to large areas of employment.

Note the Esso case study, for example, where apparently highly-effective control is kept over manpower numbers and costs while ignoring the "establishment" concept completely. In such organisations, indeed, the whole notion of a particular "vacancy" may often be little more than an abstraction, a convenient administrative fiction, one possible solution in a spectrum of available choice and action. The modus operandi of such implicit norms of behaviour, informal networks of communication/co-operation/feedback, frequent tactical and organisational shifts in pursuit of agreed strategic objectives and the few but essential mandatory targets, and common understanding of and discretion in broad and often unwritten policies and managerial attitudes, that the precise size and mix of job or person population at any given time may be of little operational concern. There may thus be a dozen paths to a given goal, the optimum route changing almost from day to day and depending on the judgement of particular individuals in a position to perceive the operational need to act and trusted so to do. In such a culture a "mismatch" of some kind may be adjusted to in a variety of flexible and subtle ways to shift the complex patterns of relationships and activities and to optimise the total situation.

Such firms reporting a vacancy, for example, to some outside public or private placement agency may fill it as specified, may never in fact fill it, may fill it by some internal rearrangement, may fill some other apparently unconnected vacancy instead, or may choose a candidate quite dissimilar to the original specification. This may drive a Labour Exchange Manager to despair, but the apparant inconsequence of this approach may in fact be highly efficient.

It is the difference, in other terms, between a free-market mechanism steered remotely by few but strong overall controls, and a highly-managed and rigid economy with detailed centralised planning controls and rationing. Indeed, the whole tidy concept of a"vacancy" as commonly understood may well be suspect, and the same may apply to our understanding of the behaviour of the various labour markets - "The" Labour Market - and the allocatory mechanisms within them, and of what actually happens in matching persons and posts within organisations. Such considerations must lead to a certain distrust of person/post systems, except in certain very specific situations, and this is heavily reinforced by their complicated and expensive nature.

The post/person relationship has, however, to be taken into account any manpower information system. Proceeding from the starting-point that it is far more useful for nearly every purpose in common systems and for the majority of purposes in domestic systems to describe people (and treating the job they are doing as one such descriptor) rather than positions, there are nevertheless several data characteristics in the classification of which it is not always easy to draw this distinction self-evidently and to frame definitions which will leave respondents in no doubt on the matter. Thus in Qualification Category should we classify the person by the actual field of qualification or skill he possesses, or by that normally required to carry out the Occupation Category activities he is engaged in? Similarly, if some kind of Skill Level field is employed, either separately or incorporated within the Occupation Category classificatory structure, is a man to be classified as "Professional" because he himself is the possessor of a degree or membership of some professional body or because (even if he has no qualification of this kind) he is performing work in an Occupation category which itself is regarded as denoting Professional Level? (The same question arises with Skilled Crafts and other such level concepts). If the answer to the latter question, seems clear-cut when thinking of engineers or physicians, is it equally so in e.g. creative, entertainment or recreational spheres?

Such choices are not easy to make or subsequently to define satisfactorily. Sheer logic and consistency in principle may sometimes need to be sacrificed to common sense, e.g. the two kinds of question above, related though they are, may in practice require different kinds of answer. Certainly the issues raised by post-person considerations are not straightforward and contain some hidden traps. They need wide discussion if useful solutions for common purposes are to emerge.

PERSONAL/ADMINISTRATIVE CONSIDERATIONS

By such is meant, for example: name, identifying number, birthdate, sex, marital status, taxation,insurance and income data, hours worked, absence, health data, employment status, etc. etc. For obvious reasons, it is often known as "tombstone data". This class contains more data, which is more widely used, than any of the other three classes. Most of it is generated by and needed for administrative purposes and much arises from payroll applications at micro-level. In spite of the large number of different characteristics and the sheer volume of flow this class of data is well-understood and even the most unsophisticated firms cope well with its administration and upward reporting.

It is immediately evident that certain characteristics are common to all human beings (e.g. a birth-data, a sex) and others very widespread (e.g. income, regular employment). The way in which such characteristics are defined, counted and aggregated varies widely, however, (intermediate levels included). Fortunately very few personal or administrative characteristics are needed for broad common purposes either at macro-level, or, say, across enterprises. Much of the data requirement is for specialised intermediate purposes, e.g. tax or health details (though this level uses, of course, most or all of the high-common-factor characteristics as well). It is heartening to reflect that what small, simple employing organisations can cope with adequately by manual means should present few intrinsic problems to a large common system. It should not be difficult to establish a consistent common framework of definition, classification and coding for the few common characteristics required. These might be confined, at least initially perhaps, to e.g., sex, marital and parental status, employment status, working hours, and income (gross only, perhaps). Employment status should include provision for measuring the rapid growth, in some countries at least, of the self-employed and of leased labour.

Certainly, this class of data should provide fewer problems than the others.

LOCATIONAL CONSIDERATIONS

Locatory classifications identify individuals and populations by their employing, organisational (line and function), economic, geographic, and administrative affiliations, e.g. employer, sub-organisation, organisation-function, workplace, cost-centre, payroll point, economic sector, domicile, local government, region, tax area, school, etc.

Such locators are essential in both domestic and public systems and at all levels. Their importance and the problems associated with them (i.e. incompatibilities between them, and questions of classification and counting) often seem to be sadly underestimated and misunderstood, especially at macro and intermediate level. This class of data contains several sources of potential confusion and poor manpower statistics, and some severe practical problems in the path of those who wish to improve manpower information for government. Among these are the closely-related treatment and definition of workplace or "establishment", of employing entity (i.e. firms, institutions and small employers), and of economic sector (Standard Industrial Classification).

The following simple example may give some insight into the practical issues that have to be pinned-down and dealt with by suitable classificatory approaches and by clear-cut definition and methodology: we will take two firms of the same industry and essentially the same internal organisation and size and composition of workforce.

The only difference is that one is concentrated on a single site, the other is geographically dispersed. (See page 22).

The difference in the distribution of manpower by S.I.C. is most marked. In a more organisationally-complex example it would be easy to demonstrate the further variability that could be introduced according to the viewpoints and inferences of the person or persons doing the counting. Exactly the same problems are faced within large and especially multinational firms attempting to analyse distribution of manpower by organisation-function: unless the interactions between this category and the firm's organisation levels are carefully thought-out and defined beforehand the result of summing the submissions from the various parts of the enterprise is likely to be statistical nonsense and of little practical use unless interpreted with a great deal of knowledge of the enterprise as a whole.

This simple example should suffice to give some idea of the practical problems inherent in classifying and measuring the distribution of manpower by locatory characteristics. They occur in micro-systems, but particularly in medium and small-size firms present few problems since the total domestic environment is readily comprehensible and widely understood by those using the resulting information within the firm. The problems are more difficult in big organisations and the concepts and solutions worked out by these to solve pressing practical managerial needs must be of value to macro administrators and statisticians who face the same difficulties on a national scale, (but who may not fully realise this). They are in no position to comprehend and make allowances for the vast variety of organisational, technological etc. realities underlying the locatory manpower data they collect, which may appear as viewed from above, as it were, to give a perfectly reasonable picture while possibly in fact being unrealistic or inappropriate to the kinds of decisions being made. The realism of statistics of manpower distribution by locations of various kinds can only be checked by appraisal of the results of painstaking and widespread sample surveys.

It thus becomes quite essential to define very carefully, for example, how the organisation - function category embedded, sometines not very distinguishably or consistently, within industry-sector classifications is to be applied to a) employing entities, b) the workplaces they control, and c) functional units or manpower within such workplaces. This needs to be done without thereby creating on the one hand a vast methodological apparatus or on the other suppressing useful information or creating statistical inconsistencies.

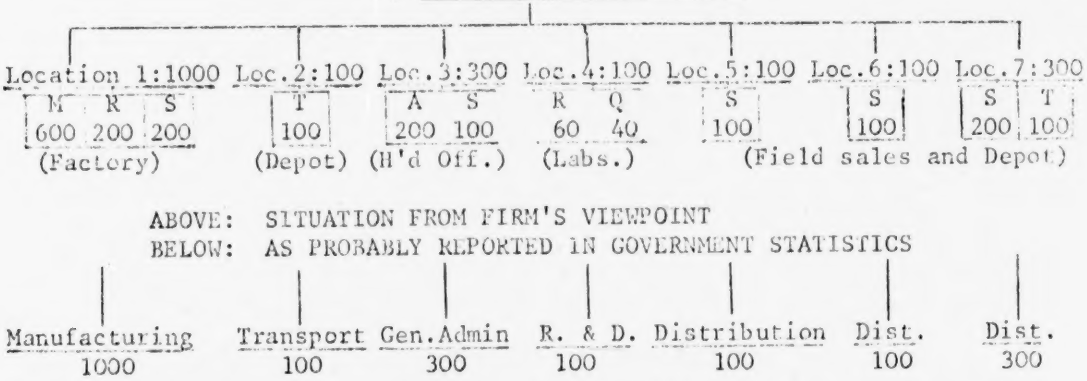
Some of the issues to be faced emerge clearly from this discussion and example:

1. Treatment of firms and institutions both as entities and as component workplaces.

EXAMPLE

FIRM A 2000 employees in seven geographically separate workplaces. Six organisation-functions i.e. Manufacturing (M), Transportation (T), Central Management and Administration (A), Research and Development (R), Quality Control (Q) and Sales/ Marketing i.e. Distribution (S). Immaterial to this example is the line-organisation or the technology or end product involved.

Firm A : total 2000


Location 1:1000
M R S
600 200 200
(Factory)
Loc.2:100
T
100
(Depot)
Loc.3:300
A S
200 100
(H'd Off.)
Loc.4:100
R Q
60 40
(Labs.)
Loc.5:100
S
100
Loc.6:100
S
100
Loc.7:300
S T
200 100
(Field sales and Depot)
ABOVE: SITUATION FROM FIRM'S VIEWPOINT
BELOW: AS PROBABLY REPORTED IN GOVERNMENT STATISTICS
Manufacturing
1000
Transport
100
Gen.Admin
300
R. & D.
100
Distribution
100
Dist.
100
Dist.
300

The count may vary somewhat according to the interpretation of the classification and of the counting rules (and with the possibility of selective taxation by occupation/industry/area introducing distortions), especially if each workplace submits a return to government independently.

FIRM B Exactly like Firm A, except all functions and all 2000 at one workplace:

Firm B : total 2000

M	T	S	R	Q	A
600	200	700	260	40	200

ABOVE: SITUATION FROM FIRM'S VIEWPOINT
BELOW: POSSIBLE ALTERNATIVE SUBMISSIONS, DEPENDING ON SPECIFIC NATIONAL RULES AND INTERPRETATIONS OF SAME.

a) Manufacturing 2000
b) Sales 2000
c) Manufacturing 600 + x, Sales 700 + y (remaining manpower distribution to M & S)
d) Manufacturing 600, Sales 1400
e) Manufacturing 1300, Sales 700
etc.

n) as from firm's viewpoint (but difficult in practice to maintain consistency across all firms)

2. Statistical consistency as between concentrated and scattered workplaces.

3. Treatment of small verus large workplaces.

4. Multiple organisation - functions and other sector-characteristics within firms and workplaces.

5. Organisation level at which functional manpower is counted - very critical.

6. Clear identification and ability to separately treat component characteristics in Industrial Classifications i.e. raw material, finished product, technology, process, function. These classifications need critical reappraisal for manpower purposes.

7. How to avoid suppression of useful information about large bodies of people in counting by function.

Such problems are easier to propound than to find reasonably practical and acceptable solutions for. Common approaches are needed to improve manpower statistics associated with Locators of various kinds.

OCCUPATIONAL CONSIDERATIONS

Occupational data forms a key class of information of fundamental importance, yet in no other class are there encountered such widely diverging and frequently unsatisfactory classifications, whether at macro,intermediate or micro levels, and both within and between countries. This is bad, since occupational data is not only useful in itself for many specialised purposes but when combined with other characteristics reveals information of enormous value. It is its combinatory or linking aspects that are so important. In particular, when combined with economic sector data it is of great utility in the management of the economy. This is a vital bond and it would seem essential that Industrial and Occupational classifications be designed to interlock so as to reveal the maximum information and give high analytical power when matrixed together. Almost as important is its interpenetration with the Qualificational data class. Occupational data provides the essential link between economic and educational preoccupations of government, and there are counterpart needs at micro level. Important, too, are interlocks between occupation and personal administrative factors such as income and hours worked and, to varying degrees, age, sex, employment status, geographic location etc.

Unfortunately many existing occupational classifications are poor or outdated, taking insufficient account, for example, of the growth of professional and service jobs, of non-manufacturing sectors of the economy, of new skills and technologies etc. Nor, frequently, does their structure sufficiently recognise the opportunities and demands of EDP systems or the experience of large employers in coping with complex high-volume manpower data and extracting useful, consistent and meaningful information from it in formats and amounts suited to the managerial process. Finally, too many occupational classifications have been built upon or distorted by particular and specialised administrative processes and needs.

There is wide disagreement on the content and structure of occupational classifications. The fact that different firms use different classifications is to be expected, and indeed domestic ones should be based on domestic needs. However, the existence of varying classifications at intermediate levels is to be deplored. If there is consistency here, firms can follow and submit data without much trouble while still meeting their own particular needs.

It seems desirable, therefore, to ventilate some of the issues which divide opinion. They are ones which appear to generate almost theological passions at times and indeed if all the pros and cons were argued here this introductory chapter would turn into a book. What follows may be said to represent a broad consensus of the experts and representatives engaged in this present investigation, who are all closely engaged in the design and operation of manpower systems, mostly at enterprise level. It is thus propositional in tone and some of the points may well arouse disagreement among some readers. This is all to the good if further discussion is stimulated-this is one of the purposes of this chapter.

1. Occupational classification needs to be by function, that is by activity, or what is done in the occupation. It can thus be related to and checked by a reference-file or dictionary of agreed descriptions of occupational content. Given this ability to refer back to definitions, simple familiar terminology and shorthand "titles" may be used (with care, since like identical job titles in different organisations they can be misinterpreted by those who will not bother to read and match descriptions). This is because the sort of people who prepare and submit data cannot be expected to cope with complicated abstractions and because most occupational titles have in practice a high degree of commonality and sufficient identity to maintain adequate accuracy for all but very specialised purposes.

2. It is important that occupational classifications should classify occupations, and not other characteristics as well, however closely associated with occupation function. If separately identifiable they can and should be separately classifiable as distinct categories and levels. These may well, of course, strongly amplify the occupational category data when used in conjunction with it, but if incorporated into the occupational structure

confusion, duplication and loss of analytical power will result. This is particularly true of Responsibility Level and almost equally so of Qualificational information and the characteristics contained in the Standard Industrial Classification. If such separately-identifiable characteristics are permitted to suppland data about activity, then the latter is lost. If added to it, very unwieldy tree structures result with highly iterative codes in which it is difficult to maintain the consistent identity of digit spaces.

Thus the term "chemical engineer" is useless as an occupational descriptor - it describes a discipline or a qualification and so belongs to Qualificational Category. However, "teaching", "research", "process specification", "plant design", "process controlling", "troubleshooting" are all occupational activities or functions; they may be carried out by a chemical engineer, but possibly by a chemist, or even a physicist or a mechanical engineer. The combination of Qualificational and Occupational Categories together give a precise meaning, but it is fatal to mix them in the same field (axis).

3. Similarly Responsibility Level terms like "manager", "supervisor", "trainee" are not activities in themselves but describe the degree of responsibility or authority with which the activity is being carried out. Like "chemical engineer", if the terms "manager" etc. intrude into Occupation - Function classifications they either suppress occupational information or create excessive iteration and structual problems and rigidities and, in the case of computerised systems, programming difficulties and costs. Only at the highest levels of authority can it be said that management is a pure function - an activity in itself - and thus finds a place in an occupational classification per se.

4. In the same way, unless there is an extremely strong occupation activity connotation it is highly desirable to leave data concerning sector, raw material, technology, end-product etc. where they belong - in an Industrial Classification.

5. The essential point is that once several such different characteristics are mixed in with Occupation-Function so that they are all treated as one continuous listing or homogeneous "lump", as it were, the possible permutations of characteristics within the list grow enormously complicated and it becomes impossible to code them in a structurally consistent manner. This makes it hard to find a particular combination quickly by eye and at this point programming for computer extraction, or worse, for techniques such as multi-dimensional matrix analysis, becomes a lengthy

and very expensive nightmare. It is quite essential to have locational consistency within a coding structure. The use of separate fields or axes for separate characteristics, besides being plain common-sense and normal systems practice, is essential for keeping the whole structure simple and easy to understand, permits rapid and convenient data manipulation, and greatly facilitates the use of analytical techniques. The use of such separate fields tends to be termed as "multi-axial" classification by many manpower planners.

6. Even the construction of a purely occupational classification for common purposes is not plain-sailing. Occupations are groupings of essentially similar job-activities across organisational and geogrphic boundaries. Their identification, description and definition is not in itself difficult, nor do the relatively slow changes, nationally, in occupational contents and patterns cause much problem of updating. The trouble starts with classification, and no two classifiers can seem to agree. Classification of category-type items such as occupational activity is done by similarity. Thus similar occupations are grouped into sets, and similar sets into families and families into major groupings. The trouble in the first place is that in a whole economy there is a vast richness of individual occupations and clearly there must be many cases where one occupation has similarities matching several sets. In the second place, after the first level of hierarchical aggregation, i.e. sets, it becomes increasingly difficult to work on the basis of job activity similarities alone - they begin to disappear. The higher levels have to be grouped by some extraneous factor (which should be a level-characteristic) such as socio-economic class (most usefully, perhaps) or a broad treatment of Qualification or Skill Level (which may give problems of interaction with a separate Qualification Level). At these higher levels of aggregation such "impurity" no longer matters - it is vital to stick to function alone at the individual occupation and occupational set levels only. One can see from the above that there may be a number of different ways of arranging the basic units in a classification, all equally valid for some purposes, perhaps.

7. As mentioned earlier in more general terms, the important guidelines are: to maintain the broad end-purpose in mind and avoid distortion caused by designing for, or utilising the system of, any one specialised Intermediate-purpose classification; to give due weight and utility to all important groupings, both horizontally in extension and vertically when grouping upwards (so that manual occupations, for example, are not dealt with in great detail while professional ones only receive broad treatment); to

maintain so far as possible continuities with existing statistical series; to design for compatibility and inter-connections and conjugations with other important fields, especially Standard Industrial Classification (whose characteristics can permit, when used in conjunction, great economies within the occupational classification itself), Responsibility Level, and Qualification Level and Category; use concepts and terminology and structual bases familiar and comprehensible to respondents; leave slots for future interpolations and expansion; etc.

There is clearly no "ideal" taxonomy of occupation, but if the above guidelines are followed very similar classificatory arrangements are likely to emerge, any one of which will suffice. All that can be said is that one widely-useful standard taxonomy containing a few flaws acceptable in practice for broad common purposes and to which domestic and specialised classifications can adapt easily is far better than using simultaneously three or four perfect but highly-specialised ones with low inter-compatibility, and better than allowing a decade to go by in search of an illusory ideal which if attained, would probably be out of date in a generation.

Some apology is needed for the length of these comments on Occupation as a class of manpower information, but since it is one which seems to create practical difficulties at both intermediate and micro-levels and generates some heat, and yet is so important, it seemed desirable to ventilate some of the issues and problems that appear to need greater consensus and co-operative effort if we are to get useful results in terms of manpower information.

QUALIFICATIONAL CONSIDERATIONS

Qualified manpower and the general reservoir of skill as a factor in the economy is now so important that its special treatment in manpower systems at any level is essential. This is an area where over-elaboration of systems design is only too liable to occur. Very detailed analyses of qualificational levels and categories are required for specialised purposes such as educational administration or the measurement and promotion of scientific and technological progress or detailed econometric studies relating education or skilled manpower to other economic variables etc. However, for broad policy and at micro-levels we require a fairly simple but widely useful classification by category and by level, which must however be drawn from and compatible with a comprehensive national standard taxonomy for reference purposes.

At a pinch, if economy and simplicity and convenience to respondents are considered paramount, or alternatively in the early stages of constructing a well-integrated system of classifications concerning manpower matters, it is possible that sufficient could be inferred from a combination of qualification level data with occupational and sector data to dispence with a Qualificational Category field for common purposes, and possibly to use one in sample surveys only in order to measure and anticipate change. Another possibility is to confine its regular use for broad purposes to managerial, professional and technical grades where information is probably most essential.

The provision of data about Qualificational Level is, however, vital both for general purposes and for many specialised ones. This raises problems of establishing satisfactory strata and parallel correspondences between academic, professional and vocational gradings which have already been discussed above under "Levels and Types of Information". Their solution where not already achieved is urgent, nationally, but may be extremely difficult.

The above may seem to be a very superficial treatment of a highly-important area, but our purpose is neither to conduct a comprehensive survey nor to attempt systems designs, but to emphasise essentials only and in particular those which represent immediate practical difficulties where the need for more discussion, co-operation and action is imperative.

DATA FLOWS AND COMPATIBILITY

We are now in a position to come to the heart of the matter.

A Common Language

We need a common language to provide the compatible statistical information to use for common purposes. Such a language must have a common grammar of classificatory and coding structures and rules for their application, and a common vocabulary of category and level descriptions and codes, backed up by dictionaries of definitions and descriptions. Such a language must be flexible; it must reveal maximum meaning in basic form when used in a wide-raning mode as a true lingua-franca, and will have dialect-forms which, however, will incorporate within themselves, or will be easily translated into, the basic common language.

Without employing this language analogy too pedantically this probably gives a useful picture of what informed and interested parties are seeking in every country as a means of improving the handling of manpower matters at all levels. It also happens to be am approximate picture of the approach to these problems by employers as exemplified in this present investigation. The same sort of structural step-by-step approach and pattern of development will probably be needed at higher levels as has occurred within large employing organisations and other micro-institutions developing data requirements and information systems concerning human populations.

The difficulties encountered and overcome and the considerations involved in the common language approach within such comparatively small and simple organisations are well brought out in some of the case studies. Clearly, at higher levels we have to proceed carefully, but certainly we are constrained to do something, and must do so in a planned and co-ordinated and well informed way.

Underlying Needs

The needs and pressures that have led to the development of systems of the kinds described in the case studies which follow closely parallel those increasingly felt by Governments and their agencies and by independent intermediate institutions. The following is occurring in industry and commerce:-

Increasing availability and economy of computing and communicatory facilities: effects of labour legislation, union pressures and increased knowledge in promoting better personnel policies and management and reducing "hire and fire" methods - labour costs, once committed, are hard to reduce again; changing cost-relativities of capital and labour inputs; increasing manpower costs; labour market dislocations and scarcities; increased importance of high-cost manpower quality and its monitoring, fostering and efficient utilisation; effects of automation of physical and mental processes; economic pressures for productivity and growth of productivity bargaining; effects of inflation and of anti-inflation measures on bargaining, compensation systems, and manpower costs; ignorance of labour market phenomena and mechanisms; changing attitudes of workers to work and to participation and information; growth of social tensions generally; adaptations to migratory phenomena; growth of white collar and professional unionism; increased role of agency, contract and self employed labour; legislative and union influences on forms of discrimination; on redundancy, pensions, fringe benefits and other kinds of employment conditions; growth of sophisticated management techniques and exploitation of computer in parallel fields - finance, marketing, inventory-control, work flows and deployment etc; increased role of corporate planning and logical incorporation of manpower aspects; need for longer-term planning,especially in high-technology, high-capital industries and in very large enterprises; general growth of centralisation and higher management techniques both within enterprises and government, and consequent increased demands for sophistication and volume of information.

Clearly these same pressures are operating at all levels of our society and result in the need for sophisticated and accurate information and the means of acquiring it within levels above that of the enterprise. Successful solutions at low levels are of immediate relevance at higher levels and common approaches are clearly required under the influence of common pressures and needs and in order to establish compatible and useful networks of communication in manpower matters.

A comment on the word "compatible" may be useful at this stage, since it appears to cause frequent misunderstandings and unnecessary misgivings. "Compatibility" does not mean "identity". Such is the variety and specificity of data about people required by thousands of different micro-entities and dozens of specialised intermediate agencies that multi-purpose classificatory structures and systems designed to comprehend every specific need would be an absurdity. What all these various organisations need is one common system of classifications and definitions etc. for the manpower characteristics which represent a highest common factor with minimum duplication across and between all levels and a common methodology for using it, and including several defined levels of aggregation and input to give the necessary flexibility of application: i.e. a national reference - framework within which specialised systems etc. can fit and accommodate themselves with high compatibility and "translatability". This is the lingua-franca for communication between and across levels which is desperately needed almost everywhere to replace the present Tower of Babel situation which results in incoherent muddle and misunderstanding and statistics lacking in consistency, utility, compatibility and accuracy. It is not necessary that such a framework and lingua-franca, or elements of these, be incorporated specifically and directly into specialised or domestic systems, only that correspondence exists so that translation is facilitated. Such translation is extremely simple where a computer is available, but no common-purpose or specialised system involving data about people and jobs should be so complex or employ such specialised language or be so badly defined and structured as to make purely manual translation for input preparation at micro-levels unnecessarily burdensome or prone to error. It must never be forgotten that the vast majority of respondents to manpower information requests are very small and unsophisticated organisations.

Evolutionary Stages

How in practice may we achieve such a common language? Large organisations at the micro-level have usually succeeded in so doing internally, though not without difficulty. It has been done so many times now that a familiar pattern of experience has emerged. Though it may vary in detail, in general it may be said that the evolution of formalised and systematic manpower intelligence at micro-level appears to follow a phased development, each step proceeding from the previous one, in approximately the following broad sequence:

I Basic payroll systems. Overall payroll costs. Head counts. Basic personnel functions. Development of common terminology and definitions in manpower areas.

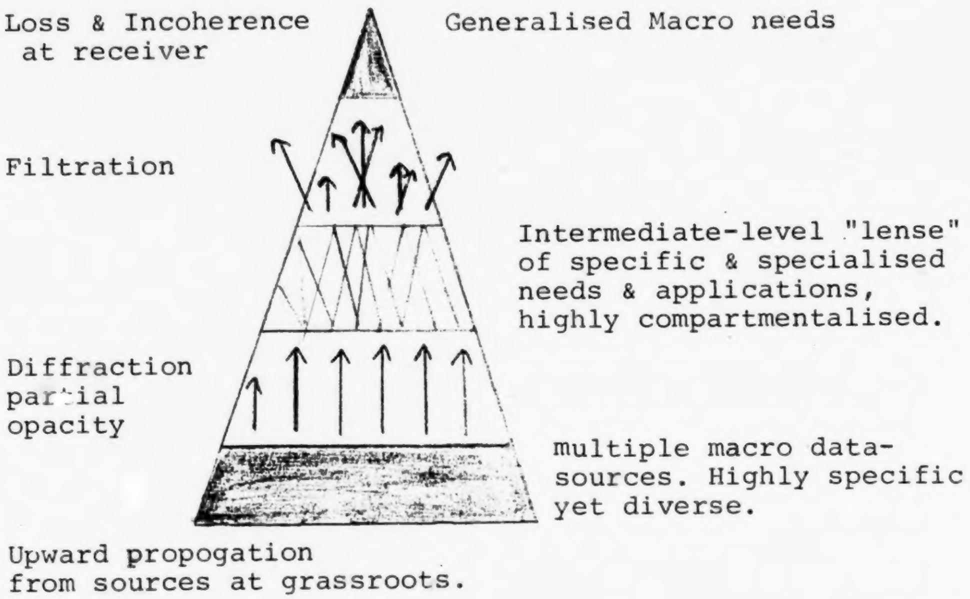
II Sophisticated payroll systems, increasingly computerised or at least mechanised. Manpower accounting develops. Penetration of behavioural approaches into techno/economic and accounting areas of management and effect on common managerial experience and attitudes etc., e.g. compensation policies and systems, productivity bargaining and economics, job analysis and evaluation, work study and scheduling, ergonomics, organisation-theory, motivation theory, manpower quality and management development etc. Consequent need for an development of common manpower classificatory structures, building on existing personnel and accounting methodologies and dependent on individual personnel records and payroll administration.

III More intensive and integrated use of EDP and associated communication links in all aspects of business. Development of common manpower information system integrating closely with common accounting/payroll system and personnel policy and administration. Improvements to manpower system and widening applications e.g. manpower forecasting, studies of population dynamics, manpower economics, utilisation and productivity studies etc. Increasing integration with corporate planning systems. As information facilities and information quality improve, manpower receives as much managerial attention as other business factors of equivalent importance.

IV Total management information system incorporating, inter-alia, manpower system? Development of micro-intermediate, inter-firm and small firm manpower information systems? This phase scarecely exists as yet.

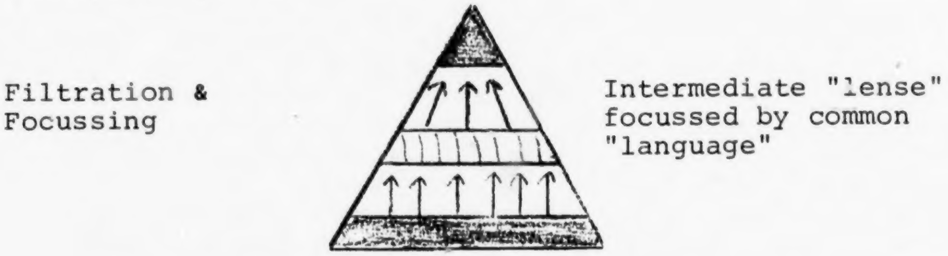
Flows of Information

One might anticipate a broadly similar pattern and sequence of development in common-purpose systems at levels above the enterprise. Close parallels in needs and approaches may be expected in macro applications which by and large are still in Phase I. Enterprise experience and developmental patterns are of relevance, though probably few employing organisations who have created successful manpower systems can have sub-organisations with as much autonomy of data-systems and administration as is frequently to be found in government. This fundamentally important task of creating a common language and the equally fundamental difficulty in doing so because of dislocations and transformations in vertical flows encountered at intermediate level, and corresponding incompatibilities at that level, are really one and the same thing. The common language for manpower purposes will largely solve data flow problems. The situation may be summarised diagramatically:-


Loss & Incoherence
at receiver
Generalised Macro needs
Filtration
Intermediate-level "lense"
of specific & specialised
needs & applications,
highly compartmentalised.
Diffraction
partial
opacity
multiple macro data-
sources. Highly specific
yet diverse.
Upward propogation
from sources at grassroots.

The above is fairly self-evident once the upward data-flow is imagined in terms of light rays of differing wavelengths, intensitites etc. instead of manpower characteristics. Intermediate institutions act as a kind of lense. Because of their specialised and highly autonomous needs and activities some of the "light" is stopped and many remaining rays are changed in their qualities and scattered, arriving at the receiver in inappropriate forms and directions etc.

However, lenses can also focus if designed to do so. What is wanted is an intermediate lense that results in something like this:


Filtration &
Focussing
Intermediate "lense"
focussed by common
"language"

The light rays then arrive on target in the required combination of angle, intensity, colour etc.

If we take the developmental experience of employing organisations as a guide, the first step in this direction is this emergence and consolidation of a common basic language to describe the human characteristics about which information is required by government and by the community at large. These must primarily be specified for macro-level direction and planning and underlying research and so far as possible must include items with a large commonality of use across the intermediate level. This is easy to prescribe, but presupposes painstaking investigations, consultations, analyses and negotiations concerning decision making and planning processes and spheres, and the resulting information requirements and possibilities of identity and compatibility, in order to arrive at characteristics which are both absolutely essential for macro-purposes and have a very high factor of joint utility and definition across the intermediate level while being widespread and available at micro level.

Common Data Items

While emphasising again that the whole tone and purpose of this introductory paper is intended to be scene-setting and indicative and by no means prescriptive and didactic, the sort of pattern and content of data that might be expected to emerge as a national reference-framework and source of common information, in the light of the issues explored so far in this paper, might look something like this:-

Class	Level	Category
Personal/ Administrative	Birthdate/Age)and in Gross Income) bands	Juvenile/Non-Juvenile Economic Role (eg regular,temporary etc. employment, retired, inactive etc.)
Locational		Employer (or institutional Workplace equivalent if not employed) SIC at/within workplace or institution Domicile (town district etc.)
Occupational	Responsibility Level	Occupation
Qualificational	Qualification Level	Qualification i.e. discipline/skill

It must be re-emphasised that the above is only a framework of reference - a common national classification and definition of these few factors. They would not necessarily all be used at once, or all by the same department - they would just be available within the intermediate level as a whole - some here, some there. They represent a highest common factor for use at individual items or in combinations together as and when occasion demands. Nor, of course, do they represent the sum total of information required. Each department, agency or institution would continue to have additional items and classifications of its own, and would no doubt interpolate additional levels, category items and digit spaces etc. within any of the above classifications which it used. However, for common purposes they could then contribute from their own data stock (insofar as it contained any of the above fields) to a common pool of knowledge in common terms using the above framework and content as a lingua franca. One would expect that the mere existence of such a set of standardised classifications and definitions would give a common language of some immediate value reflected not least in improved statistics, and this is what usually emerges first in employing organisations under the pressures of need and common convenience: an initial common terminology and set of definitions, upon which is subsequently built, usually with some difficulty, an array of compatible classificatory structures as the need for them becomes painfully apparent and they emerge as indispensible.

First Stage Gains

It is not until this first major stage is successfully accomplished that one begins to achieve some real pay-off. When one does it is fairly substantial. It is hard to achieve, both intrinsically and also (and especially) because such a process presupposes that intermediate institutions and departments must alter their own administrative systems to accommodate or take account of the "common language". However, any one such intermediate organisation will only need to do so in respect of whichever of the characteristics above happen to be used and reported by it in some way; it certainly does not have to incorporate the whole framework. Given this much, which is difficult but not overwhelming so, we then have the basis for a reasonable and useful gain in consistency and compatibility in manpower data across administration and the "lense" begins to focus. There is a good return from substantial but not excessive effort and quite small expenditure.

The specialist requirements of intermediate level institutions need such a framework to develop within; and micro-level organisations need the consistency of a common language with which to report upwards and across for common purposes (to government, to industry and training associations, for interfirm comparisons and pay surveys etc.) If these developments are not pushed forward faster and more determinedly than is the case in many countries, the growth in size and inbuilt reasons for resistance to change and sheer diversification and complexity of highly-specialised administrative systems at intermediate level is likely to make fundamental improvement increasingly difficult as each year passes. (Note that the development of EDP applications in administration can hinder as well as help in these circumstances since the investment represented by large autonomous systems is so high, and some countries are already giving themselves severe problems and storing up great trouble for the future by installing a wide range of incompatible hardware and software across administration).

An example is the establishment of statutory Industry Training Boards in the U.K. before the development of CODOT and its dictionary of occupational descriptions provided some basis for a common national language for occupational information at least. The result has been that each Board under the pressures of real immediate need developed its own classification in isolation, and to varying degrees of usefulness, and employing varying approaches. The potential opportunity for Britain to acquire really useful detailed manpower information on a compatible basis for wide purposes at all levels was therefore lost and will not be easy to recover.

The difficulties at this primary stage are less economic and technical than human - getting all those concerned to a point of consensus on rather complex matters and persuading them to jettison or at least amend what are in effect vested interests. However, it has to be done. The underlying push of events, needs and opportunities is in this direction and something of the kind will inevitably occur. It is a question of helping it to emerge smoothly and with maximum effectiveness and utility to all, rather than with severe birthpangs and muddle, friction, and costly delay. Given the achievement of this much progress we gain greater statistical compatibility and administrative co-ordination across the comparatively narrow but essential range of human characteristics of common concern and usefulness, and the ability to cross-check the appropriate data held and reported in different places for different purposes. This is a gain worth striving for.

First Stage Deficiencies

Experience of employers suggest that what has been described above is very much a temporary phase which is soon outstripped by need and which, in any case, has inbuilt instabilities and tendencies to erosion. There are several reasons for this:

1. It is difficult to maintain consistency within a laid-down framework of common definitions etc. by prescription only - there must also be clearly felt operational pressures so to do, otherwise the tendency is for local and departmental mutations to occur.

2. There may be little incentive for such local and departmental organisations to maintain consistency and accuracy of input.

3. Such an approach, while an improvement, still gives no intrinsic guarantee of accuracy and consistency because its input in most cases is aggregated and not individual data.

This latter point needs some brief explanation. We may take the example of using a multi-dimensional matrix for analysing data drawn from different sources (say, Ministries) on e.g. occupation versus income versus education, or age versus occupation versus industry (and information from these kinds of linkages becomes more and more important for macro-purposes). It is essential that the population represented by the axial characteristics be the same, so that each individual in the population within each matrix-cell has the same characteristic pattern as every other individual within the cell. It is only by counting the characteristics of individuals within populations that we can be sure that we are comparing like with like and arriving at correct conclusions. Also, we can only be sure of monitoring the accuracy and consistency of our data by having the facility if necessary to check back to the individual records which are the ultimate source of all manpower information. This principle, so self evident for centuries in the administration and accounting of financial data, is equally valid in manpower administration.

Second Stage: Individual Records

A fundamental qualitative transformation thus occurs when the manpower information systems depends on input, update and audit of individual records in each data field. Only when this is possible will the system describe each individual person as the sum and pattern of the characteristics of concern to the organisation, and as a contributor in respect of each of those characteristics to aggregated information about each characteristic and, as well, to the totality of characteristic patterns and populations of the organisation. It is the capacity to reconcile aggregations and patterns back to individual records that permits proper satistical consistency and accuracy and their safeguarding and maintenance through validation and audit procedures.

If sub-organisations are autonomous (from a system viewpoint) and only report aggregated data to the centre, validation and audit are difficult and even centrally-imposed classifications and their associated definitions and methodologies will tend to erode and mutate.

All payrolls, for example, are based and depend upon individual records. Payroll systems necessarily have a very high degree of statistical accuracy and consistency. Their validation and audit are essential and their nature and purposes are such that there is rapid feed-back of error, errors usually having immediate and inconvenient consequences. That is why payrolls, which contain a lot of personal/administrative and locatory information about individuals and a high degree of self-regulatory accuracy, form so useful a basis for manpower information systems.

There is thus a fundamental distinction, an upward step involving a qualitative transformation, in the translation from reliance on a 'common language' and aggregated reporting to the establishment of a common systems and data bank based on the input of individual records under specified characteristics. It is not until this second and quite crucial stage is achieved in employer systems that any confident and realistic manpower planning and use of its resources by management can be attempted, or that manpower and personnel considerations can begin adequately to be integrated into corporate planning in larger organisations.

It would seem a reasonable assumption that the same applies to macro and intermediate applications (and indeed many of the latter, particularly those specialised ones concerning financial aspects of manpower, cannot themselves operate without individual citizen's and employee's records). Only when the corresponding stage is implemented at or for intermediate levels are we likely to overcome the overlapping of data populations and data submissions, reduce the incidence of the latter, and begin to operate and apply manpower intelligence in truly economical, convenient, efficient and accurate ways and improve the quality of manpower statistics on which so many common purposes depend.

Third Stage: Integrated Systems

A number of intermediate-level systems are already based on individual records, for example usually for the administration of taxation and social security and frequently in education and health services. Others exist at local government level. If we envisage the extension to an individual basis of employee data concerning sector, occupation and qualification basis of employees, perhaps collected regularly if infrequently by payroll census, we can begin to see the need for evolution, as in enterprise systems, of an integrated system and data bank based on individual record submissions located by individual identifiers for each record "citizen numbers". The "citizen number" identifier makes it possible to integrate individual records drawn from within separate systems to produce various data for unified populations. It then becomes much more convenient to integrate the various separate systems themselves into a common multi-field mult-purpose one paralleling at intermediate level those discussed in the case studies which follow (for example the "federalisation" of the individual departmental personnel and pay systems in the British Civil Service). Only at this stage can we obtain full advantage from the computer and it then produces great gains in economy and simplicity of processing data. So great are the advantages, in fact, that some such development would seem quite certain and indeed Sweden, for example, has moved some way in this direction and the Swedish experience deserves to be better known elsewhere.

Thus compatible and well-integrated classifications and methodologies must be applied to identical populations if trustworthy and economical information of high utility is to be obtained.

Intermediate Level Information Networks

It is possible to visualise very broadly how such a development might come to be established within the intermediate level. It has to be located there, since as we have seen this is the crucial focussing link between micro-based grassroots data and macro-needs and purposes. In view of the extremely large potential volume of data and likely technological constraints the population base of a common purpose data bank could not be too large, and this would seem to dictate a series of banks or manpower information centres using one common system (as in the U.K. Civil Service design). The vertical compartmentalisation of intermediate data needs and sources would indicate the basing of such centres on convenient administrative boundaries - districts or regions. Each would handle the data derived from the population of that area. It would probably start initially by siphoning-off duplicated data from the upward flow, at least for some selected data fields, through the area-centre bank on their way upward. Such systems might be expected to be, initially, those of taxation and social security, for reasons already outlined. It would then be drawing directly from payrolls, for example, and from local offices of intermediate departments and institutions and from local government departments. It might finally draw directly from grassroots citizens by sample census and possibly national census methods. Each area centre would contribute to a national network in which highly aggregated data would finally be processed and reported centrally for macro-purposes. Output would not only flow upwards, of course, but also sideways, and downward too, in suitable forms. Such an integrated system providing both horizontal and vertical co-ordination and services in fully compatible form could only evolve gradually by accretion and intervening consolidations. Its service aspects might also be expected to evolve, for example in providing data bank and computing facilities to local governments and to small firms on a collective basis. An alternative evolutionary path might result from building directly onto existing taxation and/or social security systems with their individual records, thus paralleling employer systems built onto payroll systems. However, there could be many disadvantages to inhibit this approach, and few advantages beyond initial convenience.

The above sketch is not written to advocate what ought to be and should occur: its intention is to give some idea of what will occur to some degree and in one form or another. Some such system will develop in most countries, whether we like it or not. It is becoming harder and harder to run modern societies without adequate manpower intelligence of the kinds, to the levels of accuracy, and in the forms and flows that have been outlined. We are all being impelled in this direction and the appropriate knowledge and technology becoming available will not lie unused in the face of increasing demands and opportunities. The question facing each country is how to gain the advantages without corresponding losses.

On this point, if we are not to create a whole network of little "Frankenstein's Monsters" much thought must be given to safeguarding public liberties and individual privacies. Some basic rules would seem obvious such as:-

1. Defined levels of aggregation of output: a) to government, b) to public at large, news media etc., c) to micro-level, i.e. to contributing institutions.

To avoid identification of individuals and firms.

2. Contributing institutions can only get out, additionally to 1. above what they themselves put in:

   a) as regards highly specialised or low-aggregation output, with exceptions by consultation with other contributors represented in the output data.

   b) as regards individual records - with no exception whatsoever.

However, whatever safeguards are set up, the emergence of such public systems may be expected to cause great unease and hostility and great attention will need to be given to the political and human relations aspect of the translation of advanced manpower systems from the micro-level to higher level applications. Here is yet another argument for evolution not revolution in the growth of such large systems. The resulting developmental time-scales when reviewed against the probable underlying needs and pressures reinforces the urgency for bodies such as OCED to persuade interested parties and not least governments to work together towards viable solutions to these common problems.

There is little point in speculating from the national viewpoint on the possibilities of total information systems, since they are at present little more than a concept even within the most advanced systems-using micro institutions.

CONCLUSION

Hopefully this introductory chapter and the main report which follows, which it has tried to illuminate, extend, and link to the wider issues, taken together will indicate some points of departure for the further discussion and development that is needed. This introduction has not attempted a comprehensive treatment but has concentrated on a few key issues and has tried also to highlight those which have proved particularly important or difficult at the enterprise level and which would seem likely to prove stumbling blocks in the development of similar systems for more generalised purposes at high levels. Many useful matters have been ignored which are of lesser importance, are pretty self-evident, or are purely technical.

It may indeed be thought by some that too many "nuts and bolts" issues have been dealt with which should have no place in such an introductory survey. In the first place, it seemed desirable to include some broad explanatory material to aid the understanding of the discussions and case studies that follow - and the point has been made that a fairly wide readship is assumed for this publication since its contents have relevance to others besides specialists. In the second place, there would seem little profit in exhortation or purely theoretical discussion when the realities in the way of progress - apart from political and human relations issues - are precisely these same highly practical and real problems that crop up time and again in developing solutions to similar needs within employing organisations. They are extremely important and must be understood by those who employ experts as well as by the experts themselves, since at some time decisions will have to be made.

As for the human relations and political difficulties these have, it is hoped, been sufficiently stressed, since it is in the nature of experts to tend to leave them to one side while concentrating on the interesting technical challenges involved.

The following recapitulates the main thread of the comments made:-

Governments require increasingly complex human data in order to govern increasingly complex societies. The same applies at lower levels, and EDP systems are needed and are available, but we are only beginning to understand how to use them effectively. Most data required is generated by administrative processes and although requirements increase fortunately the main characteristics concerned are comparatively few. This permits their integration and permutation to produce sophisticated information by computer (which can handle the volume aspect as well). To do so we need a common framework and "language" concerning these human characteristics to unify the frequently overlapping, conflicting and incoherent data needs and supplies at intermediate level. Such tools and methods will integrate under the pressures of needs and events (and this process though ultimately inevitable needs to be helped and planned-for to avoid inefficient, costly and indeed dangerous side-effects and delays) to the point where networks of common data banks and systems for manpower-oriented purposes evolve based on individual records, "citizen numbers", and probably on existing public finance-oriented systems dealing with people. Such manpower systems must be kept simple, comprehensible, and confined to few but essential characteristics, and be designed to serve well-defined end-purposes. Among the technical problems are the treatment of locational and occupational characteristics, their mutual linkages, and their joint linkage with qualification. However, the main problems associated with these developments, which will certainly come about in one form or another, are the human, moral and political ones, where the provision of safeguards is needed, though not enough in itself if essential liberty and privacy are to be preserved.

It is worth making a further general point - that it is our misfortune to be living at a stage of civilisation which appears to be approaching a peak of "disorganised over-organisation". This seemes to be because change, complexity and knowledge are growing faster than is our human capacity to deal with them. We really do need computers and their associated systems and ways of doing things to help us in this situation, and we must learn fast how to use them well, or the mess will grow worse. In the field under discussion the symptoms of malaise are ever-increasing ill-co-ordinated demands, and subsequent floods of rather muddled, incompatible and frequently inappropriate or inaccurate data which is only too likely to result in ill-directed action with unforeseen and unpleasant side-effects.

What is needed is not more data for government (or for that matter for management) but better data in optimum amounts. Given intelligent and informed appraisal of the needs and possibilities it should be feasible to learn how to apply the remedies which are now to hand to provide elegant and economical solutions to our current administrative and statistical difficulties without endangering the community or the individual. The result may well be less volumes of data flow, less inappropriate and detailed government intervention at lower levels, and far less form-filling, effort, and inconvenience for all concerned.

This certainly is beginning to be the experience with effective manpower systems now in use by large employers. Once updating of individual records becomes routine and accepted as a matter of self-interest and once managerial accountability, planning and control procedures for manpower are programmed into the system in ways compatible with corporate policies and procedures, much human effort and worry disappears and top management can direct affairs in manpower areas in a more relaxed and confident way and with fewer "panic" investigations and off-the-cuff decisions. If we can learn from these new developments at the enterprise level we may begin to be able to manage wider human affairs a little more effectively.

Thus requirements for manpower intelligence at all three levels have emerged in parallel with the rapid extension of the application of EDP and its capacities and potential to handle data. Initiatives for wider use of this potential have been taken at all three levels, but there are too few signs that this is part of any integrated national or even institutional policy. It must be recognised that where there is an absence of centralised responsibility for manpower information as a unified field and a tradition of organisational autonomy in this aspect there will be both technical and human difficulties in the way of improvement. However, real needs brought the computer into being once the underlying knowledge and technology had been achieved,and real needs will enforce its effective use in the long term.

In most countries covered by this study many different attempts towards integrated data systems are under way. These are for the most part mutually exclusive and based on different criteria. If introduced separately by irreversible action (legislation etc.) these will preclude any co-ordination between the systems of individual firms with one another and with any government system, quite apart from the possibility of international co-operation. The result will be that systems at micro level must adjust and adapt - often at great expense - to incompatible systems introduced at government level.

This general situation is thus of concern to OECD. Although OECD has not started a comprehensive work programme specifically aimed at approaching the manpower data problems in an integrated way, it has come across it in the implementation of a whole series of separately-conceived research projects and other activities. The assessment exercise of countries' performance in manpower policy, under way since 1967, has been greatly hampered by the lack of adequate data at all levels. Projects in the field of educational planning and manpower forecasting have figured in the programmes of the various committees for several years. Methodology has stuck at the lack of structure and data which can only be supplied if compatible systems are developed covering the characteristics of supply and demand and integrating the macro and micro level requirements. During the discussion in the project on the uses of EDP in the Employment Service this issue was one of the principal points raised. In the preliminary work on the functioning of the labour market (project on behaviour of enterprises and households) the lack of an adequate data input from the enterprises and vice versa has been shown to be a major obstacle to an effective adjustment of supply and demand and to a rational formulation of policy both by management and by the individual.

At the 1970 OECD International Lisbon Conference on Enterprise Manpower Planning for Change, the present state of co-ordination between private and public manpower planning and programmes was stated to be far from satisfactory: stress was laid on the fact that both enterprises and public authorities depend on an improved flow of manpower data from the enterprise to the authorities and vice versa. Another conclusion was that the development of compatible classification and data systems is one of the most important prerequisites for the integration of hitherto isolated planning systems.

This last problem turned out to be a prime issue of the 1969 experts meeting on the use of EDP in Personnel Management from which the present study originated, being then conceived at the first stage of a project aiming at approaching the data problem from the micro level.

The study now presented was therefore designed to be policy-orientated, to cover data problems in relation to policy formulation and implementation at at all levels, and with a view to the interdependence between governmental and intermediate data systems on the one side, and personnel data systems within the firm on the other. It was not intended as a technical EDP study in the narrow sense. It is hoped that as it stands now it will provoke:

1. further thinking and development, including studies, on the part of the agencies responsible for governmental and intermediate manpower areas;

2. the promotion of personnel policy at the enterprice level;

3. a comprehensive approach by all concerned with manpower data problems, in particular towards the improvement of the co-ordination between these systems

Also,

4. individual enterprises may learn from the experience of others, especially from those which were the subject of each case study.

OECD's hope is that activities such as the present study will quicken progress and stimulate confidence that what can be achieved by enterprise may also be possible to apply appropriately at higher levels and can help provide solutions to urgent common problems of national and indeed international importance. What is needed now is fuller exchange of experiences and ideas than heretofore so that useful and acceptable policies and plans can be framed and implemented. As a first step more opportunities must be created for those concerned to get together - whether politicians, administrators, managers, manpower planners, economists, statisticians, personnel managers, or systems analysts. However, as an enterprise level, it is only when such people can begin to work together that real learning and progress will be made.

CHAPTER II

OVERALL SUMMARY, CONCLUSIONS AND RECOMMENDATIONS OF THIS REPORT

BY: J.E. Bayhylle and
B. Linder

We are presenting our conclusions and recommendations to this report now so that various levels of interest can see what sort of results were obtained without the necessity to read through the study itself. Further, we feel that a preview of the study will enable a higher degree of selectivity when reading the remainder of the report.

As we have stated in the preface, we hope that this report will be of interest to governments, institutions, enterprises concerned about personnel systems, and manufacturers of computer equipment. We thus hope that this summary will lead the interested party to the appropriate part of the study.

This chapter is basically in two parts. The first part is a general introduction to the study itself: The methodology; the timing; the costing; and a note about the principal collaborators. The second part is a summary of the results deriving from the study, followed by our recommendations.

DESCRIPTION AND DISCUSSION OF METHODOLOGY

1. BACKGROUND

In June 1969 tentative meetings were held between the OECD and the Swedish Council for Personnel Administration (PA-Council) to determine the need and feasibility of a study into the developments of the use of EDP in Personnel Management. Also considered was the implication such development would have on intra and extra-firm labour markets. The PA Council agreed in principal to undertake such a study providing :-

a) Financial support became available

and

b) Technical support would be forthcoming from experts in the field of EDP applications in Personnel Management.

Accordingly, in October 1969 a meeting was held in Paris under the auspices of the OECD. Delegates to the meeting were managers who had experience in the application of EDP in Personnel Management, who in the main, were selected by their respective countries as representatives (a list of delegates is attached as Annex IV to this study).

Delegates to the meeting subscribed to the concept of the study and agreed to assist in attempting to obtain support from their countries for the necessary additional funding, or alternatively, provide the necessary technical support to complete the study.*

Delegates to the meeting further agreed to the aims and methodology of the study and agreed to render support to the completion of this report insofar as business commitments would permit.

The study aimed to investigate and report on, inter alie, the development of EDP applications in several European countries, and to what extent such developments will have effect by implication upon manpower planning systems and public employment placement activities. The study results will be two fold in that, 1) They will discuss practical aspects of the problem of the introduction of EDP systems in Personnel Management in such a manner that will provide guidance to Personnel Management in this area, and 2) They will attempt to determine, and make appropriate recommendations, to what extent there is for example a need for occupational classification compatibility that will enable better co-ordination between public agencies in the areas of manpower planning and employment placement.

* In the event it was not necessary to secure the the total finance planned with PA-Council as sufficient technical support on an unpaid basis became available. The contribution of time and effort of these people is greatly appreciated by the O.E.C.D.

2. METHODOLOGY

It was agreed that the delegates would approach select companies in their respective countries to determine whether or not these companies would be prepared to participate in the study. The criteria for selection was:

1) A cross section of type of enterprise - e.g. nationalised industry, government, private enterprise from various sectors of industry; and,

2) Either engaged in, or actively planning to become engaged in, computer applications in the personnel area.

3) Differing size and structure.

The target for participation was:

Great Britain	-	12
Germany	-	10
Sweden	-	6
Austria	-	3
Switzerland	-	3
France	-	4

In the event initial participation emerged as:

Great Britain	-	9
Germany	-	10
Sweden	-	5
Austria	-	4
Switzerland	-	3
France	-	7
Total		38

(Note: A list of those companies participating is shown as Appendix I to Annex III of this study).

While it was appreciated that the study would be biased (see selection criteria above), the delegates and PA-Council agreed that the aims of the study could not be met if a stratafied random sample of company by size, technology, country, were sent a questionnaire and were not actively engaged in the activities in question. Even so, informal information available to the investigators indicates that a sample of 38 European countries is more than fairly representative of the total population of companies so engaged.

To enable satisfactory in-depth coverage of computer applications in personnel areas, it was decided that the study would be conducted in two phases:

PHASE I - a broadly based questionnaire to all 38 participants.

PHASE II - an in depth interview supported by questionnaire to 8 of the participants in PHASE I.

PHASE ONE

A draft questionnaire relatively broad in scope was furnished to members of the OECD Steering Group (comprised of delegates to the meeting mentioned in paragraph 1) by PA-Council and Mr. J.E. Bayhylle who examined the questionnaire and recommended amendments to PA-Council. The Steering Group at the time of returning the questionnaire recommended private and public, e.g. Nationalised, companies for administration of the Phase One Questionnaire.

The PA-Council then prepared the final Phase One Questionnaire and administered it by post during April-June 1970 to the companies nominated by the Steering Group. A copy of the Phase One Questionnaire is included in Chapter IV.

The Phase One Questionnaire was used as a framework model to determine suitable companies for a rather more searching in-depth questionnaire to be followed by structured personal interviews by the consultants assisted by a member of the Steering Group.

The Phase One Questionnaire was designed to determine:

1) Name of company and Manager responsible for the Personnel EDP System.
2) The size of the company.
3) The branch of industry of the company (e.g. motor car manufacturer).
4) The geographic characteristics of company location (e.g. labour market size, economic development of area, etc.).
5) Extent of EDP coverage (e.g. type of employee covered by the system).

6) Length of time the system has been operational.

7) Primary use of system (e.g. payroll, manpower planning, salary planning, etc.)

8) Corporate organisational structure of company (e.g. whether or not part of a group, subsidiary, holding company, etc) and whether or not EDP system is part of a centralised personnel system.

A preliminary analysis of the responses to the Phase One Questionnaire was prepared by PA-Council together with a statistical analysis prepared by Mr. J.E. Bayhylle. The purpose of this preliminary analysis was to:

1) enable selection of case study comparisons;

   and

2) provide a preliminary report to the OECD and participating companies.

The preliminary analysis was completed in July 1970 which enabled a meeting to be held in Munich in July 1970 to select the 8 case study companies. At this juncture the original group of experts was expanded to include what was termed national groups for these deliberations. The 8 case study companies were duly selected, approached, and all agreed to participate. A list of participating case study companies is shown at Appendix 2, Annex III.

The members of the National Group were also charged with the responsibility of approving the content of the Phase One Interview Questionnaire.

Participating companies to Phase One were guaranteed confidentiality and anonymity in presentation of Phase One results. They were provided with drafts of the preliminary report to vet prior to inclusion in this final report. This was accomplished in December 1970.

PHASE TWO

The second phase of the study was an attempt to investigate in depth 8 companies of the original 38 who were seen to be representative of the original sample. Criteria for selection was by analysis of the factors presented in the Phase One Questionnaire. Formulation and structure of the Phase Two Interview Questionnaire was conditioned in part by responses to the Phase One Questionnaire.

It was planned originally that PA-Council, with the technical assistance of a member of the Steering Group, would administer the Phase Two Questionnaire, but in the event that proved impractical because in some instances time and finance were not available as planned. Where this situation occurred, voluntary manpower was used to overcome that difficulty. Thus the case studies as presented elsewhere in this chapter, show the person or persons responsible for the case study interview and subsequent presentation.

The case studies/interviews were conducted between December 1970 - June 1971. However, due to unforeseen circumstances it was not possible to complete the final presentation of all the case studies until June 1972. This delay did not however preclude the preparation of a draft summary and conclusions of case study material by PA-Council in October 1971. These findings are included in the study analysis included elsewhere in this report.

The scope of the case study investigations can be shown under two principal headings:

1) The content and function of the system; and,
2) The administrative and personnel consequences of the introduction of such systems.

The Content and Functions of EDP systems

Developments of EDP in personnel management and scope for application in future.

Development of an integrated management information system, or at least a closer integration between corporate, manpower and personnel planning.

Development and co-ordination between computer based personnel management operations and extra-firm manpower activities (i.e. relations with governments and other institutions with regard to: national manpower forecasting and planning; occupational census; labour mobility; employment statistics; placement, etc.)

Data requirements of EDP in manpower planning and personnel management - the scope for applications and problems arising out of these requirements.

The Administration and Personnel Consequences of the Introduction of EDP

Impact of introduction of EDP in personnel management on relationship between various functional areas of management.

Technical and organisational problems arising out of change-over to EDP in specific functional areas of personnel management and implications on status, attitudinal patterns and qualification structure of personnel management staff.

Observe any organisational or functional change as a result of EDP in Personnel Management. (In all areas, as well as personnel departments).

Technical and organisational problems arising in change-over to EDP in enterprise manpower planning and in specific functional areas of personnel management, and its subsequent impact on personnel management, methods, philosophies,etc.

Implications of introduction of EDP in enterprise manpower planning and personnel management on status, attitudinal and qualification pattern in personnel management.

Implications of introduction of EDP in enterprise manpower planning and personnel management for distribution of functions between line management and personnel management.

Impact of introduction of EDP in enterprise manpower planning on structure of decision making within enterprise and establishment.

The role and attitudes of Trade Union Officials and memberships and their involvement in EDP applications.

The extent of involvement of employers' associations in the development of EDP applications.

Where the term "EDP application" is used above, the implication is of an EDP application in Personnel Management.

To begin our summary of both Phase I and Phase II and so that we can begin to see the relationship to enterprise results and what, if any, interface exists between enterprise needs and outputs to intermediate (i.e. institutions such as employers' associations) and macro needs, it seems useful to re-state some of the points emerging from Chapter I and to see if the study did in fact bring some of the issues to light.

For purposes of formulating a coherent manpower policy, governments require information about supply and demand, about the labour market which needs to be in terms of quantity and quality, and to be available rapidly. This information can be obtained from existing governmental sources e.g. the activities of the Employment Service, the Social Security and Taxation systems, Education, as well as from the Census and sample surveys. But such information is (i) global and quantitative, except for the Census and (ii) originally conceived for other purposes i.e. the manpower aspect is only a by-product. The Census suffers from the defects of being compiled at infrequent intervals and of giving a static picture. If a government is to acquire information which can be used specifically for the formulation of manpower policy, and, which, moreover can take account of the movement in the market and consider a static picture at any one time, it can only obtain this by access to the records of the basic employment units, i.e. the personnel departments of the employers.

In the implementation of a policy once formulated, a government again can only operate through the personnel departments of the employers, or at least is is largely dependent on their close co-operation; both in respect of the execution of programmes and measures and the supply of such data. For example, it must be aware of the labour market, national, regional or sectoral manpower planning,

planning of specific programmes such as training, geographical labour mobility, educational planning, and carrying out of individual measures (e.g. placement).

Over recent years data needs have also developed at intermediate level, i.e. between the level of the government and of the individual firm. Examples are: unions, employers and professional associations, and public bodies of various kinds, especially those involved in training programmes and regional development. This represents the implementation of selective policies which require currently detailed data at all levels. These requirements themselves vary according to the place of the job in the institutional framework of the enterprise, which is again modified by the state of the market. (In particular the qualitative structure of the supply).

The enterprise requires information for its own personnel policy and planning. The need of personnel policy has become evident due to constraints such as; economic factors, trade union power, increased importance of psychological and social factors, changing levels of acceptability of redundancy, scarcities in labour market, etc. These constraints coincide with the rapid development of management techniques in other areas, such as investment, stock control, marketing, production etc. Thus the personnel activity has a need for data systems which can be integrated into these functional areas and with data flowing from the educational system and the manpower market. This applies to planning, programme design and individual measures for jobs and workers.

Increasing governmental and intermediate requirements for data for other purposes (e.g. social security, taxation, and to an extent collective bargaining) have pointed the need for personnel data systems.

These requirements at all three levels have emerged in parallel with the rapid extension of the application of EDP and its capacities to treat data. The potential for the use of such data generated by the use of EDP has thus increased considerably. Initiatives to wider use of this potential have been taken at all three levels; but, there are few signs that this is part of any integrated national, or even institutional policy. This is particularly visible at enterprise level.

Governments as major employers have to a degree been the leaders in development of information systems; in the fifties the military forces and in the sixties civil service organisations started to exploit the potential of the computer. Viewing the future scope for further expansion, it may be stated safely that a series of factors will promote EDP in the manpower areas in general and in their more sophisticated applications in particular: e.g. the tendencies towards larger firms, the prosperity of technically-advanced sectors, and the arrival on the scene of the small computer which will give the smaller enterprise an entry in data processing activities.

The study now presented, especially through the Phase II Questionnaire upon which the case studies are based, was designed to give insight into the problems of, inter alia, the influence of macro and intermediate institutions upon enterprise systems designs and coding structures, and the extent to which enterprise systems did provide data from their systems to those macro institutions (hence part 5 of the Phase II Questionnaire).

The study then is not intended as a technical EDP study in a narrow sense. It is hoped that as it stands now it will provoke:

1) further thinking about data problems and development on the part of agencies responsible for governmental and intermediate manpower areas;
2) the promotion of personnel policy at the enterprise level; and,
3) a comprehensive approach by all concerned with manpower data problems towards the improvement of the co-ordination between these systems.

It is our hope that individual enterprises may learn from the experiences of others; especially from those which were the subject of each case study.

Different findings of the report are discussed below under various headings:

i) It is extremely important that there is adequate preparation for the changeover from manual to EDP systems, including close liaison between those responsible for EDP and personnel.

ii) The lack of compatible classification systems available from the Education and Manpower authorities at the time of initial design compelled private firms to develop their own. This has engendered the appearance of several systems, which unless prompt action is taken, may develop to the point of irreversible incompatibility between one another and with any government system. In one case the non-existence of government systems has brought about a complete stop of further development; in another the existence of "intermediate" systems proved a way of overcoming difficulties.

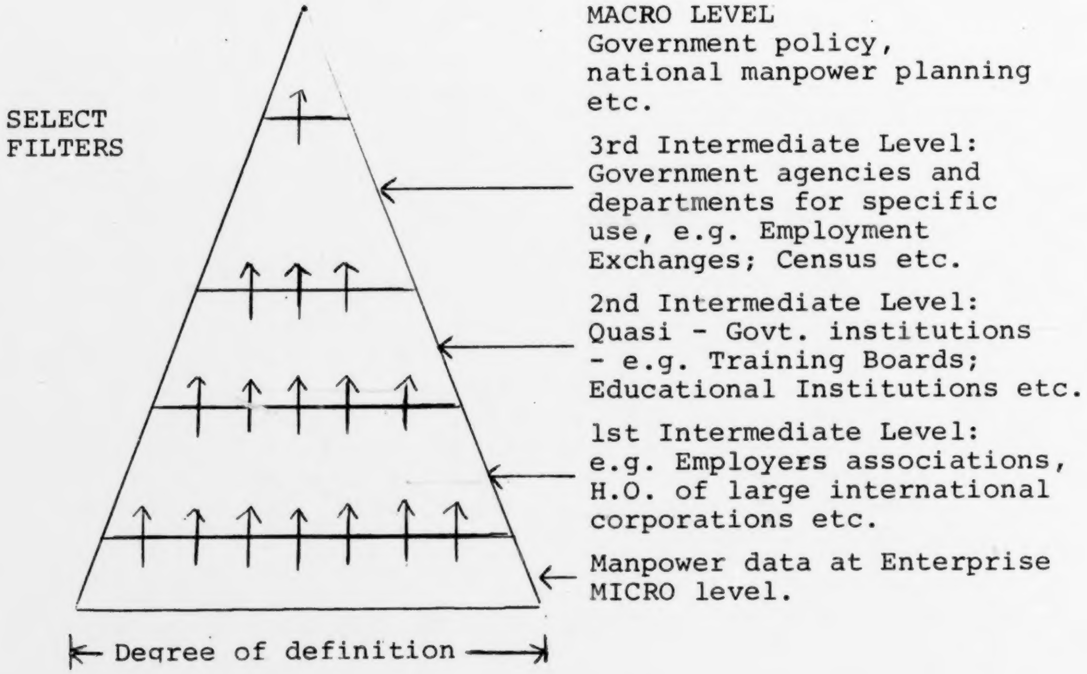
iii) The decision to develop computer based personnel data systems has implied the need to develop new personnel policies and rationalisation of existing programmes and measures.

iv) The pioneers of EDP application were the first to perceive its limitations on both input and output. Nevertheless, the applicability of EDP on a wide range of items on both sides has been proved; the greatest obstacle seemed to be the lack of software suitable for many manpower purposes.

v) The switch of EDP raises many human and social problems, none of which, however, has proved unsurmountable, e.g. privacy of the individual, change of roles of personnel management and other management, access to terminals, operation of collective bargaining and implementation of personnel policy.

vi) The key issues seem to be compatibility and not sameness. It must be remembered that enterprises need a data base that is more definitive and complete about characteristics of people;whereas external institutions need less definitive data. But if there is to be a link between the two, the classificatory language must be interpretative at all levels.

The model below illustrates the point of filtration of data about manpower.


SELECT FILTERS
MACRO LEVEL
Government policy, national manpower planning etc.
3rd Intermediate Level:
Government agencies and departments for specific use, e.g. Employment Exchanges; Census etc.
2nd Intermediate Level:
Quasi - Govt. institutions - e.g. Training Boards; Educational Institutions etc.
1st Intermediate Level:
e.g. Employers associations, H.O. of large international corporations etc.
Manpower data at Enterprise MICRO level.
Degree of definition

INFORMATION FLOWS/NEEDS

vii) In most countries covered by the study many different attempts towards national data systems are under way. These are for the most parts mutually exclusive and based on different criteria. If introduced separately by irreversible action (legislation etc.) these will preclude any co-ordination between the systems of individual firms with one another and with any government system. The result is that systems at micro level must adjust and adapt - often at great expense - to systems introduced at Government level.

CONCLUSIONS DERIVING FROM OVERALL STUDY

The first conclusion one can make from a study such as this is one related to the sample size. In statistical terms it is a very small sample (38); but in representation it is rather large. Our informal information would lend us to believe that in fact we have responses from about 70% of European companies engaged in the activity of computer-based personnel information systems at the time of Phase I (1970). The second conclusion one could make is with respect to the sample itself. Participating companies were known by members of the initial working party set up by the OECD (See Annex IV) either to be engaged or planning to set up some sort of system. Thus the sample could be said to be heavily biased. Bias was also introduced deliberately because we wanted to secure information from as broad a spectrum as possible. This can be justified partially by stating that the object of the study is to be informative to governments and potential users - and lastly as a medium of exchange from extent users. We therefore do not apologise for the sample composition.

It might be useful if the Questionnaire itself and especially the results of question I.II were read in fonjunction with this evaluation. (See Chapter V).

One of the most interesting conclusions made from the results of the questionnaire is about the apparent patterns of responses to question 1.11 about inputs-outputs and stages of development. It can be seen that the matrix or grid has been structured to show what commonality exists between respondents in the application of their systems and whether or not commonality exists in data inputs. A further search for information was with respect to the degree of sophistication of the system, and, lastly whether or not the system was undergoing further development.

For ease of visual analyses, we have encircled the most frequent responses and it is the patterns of these responses that are interesting and informative. The analyses of the responses have been separated by the stage of development - i.e. currently collected, currently being developed and planned for the future. There is also an aggregation for each of these dimensions and sub-aggregations for each country. Inspection of these patterns enables us to make some general conclusions. (Some of these observations are not supported by statistical analyses, but have been supported in the main by the case studies and by Tables 1 - 2A and Charts 1-24 Chapter V).

The patterns show that the majority of current usages are related to payroll applications with partial or whole integration with a personnel system and that the degree of sophistication is slight. (The degree of sophistication can be partially measured by the frequency of indications of input reading down and the incidence of output reading across the grid). An intersection of the two axes does not necessarily denote sophistication, but rather the 21 measures of output are arrayed in part to reflect complexity as the columns progress to the right - inputs also tend in part to reflect more categories of data in the system as the lines progress down. The clusters of responses seem to indicate that payroll applications coupled with simple headcounts and slightly more complex internal labour statistics predominate. Analyses of other responses, e.g. age of system, size of company, whether or not a second generation system, etc., tend to support the view that experience correlates highly with a realistic view of the future, and that the payroll data is used for little else but headcount information.

When looking at development plans of existing systems there seems to be a tendency for pragmatic approaches to solidifying gains already made without too much adventure. In contrast to input-output currently being collected and used, which in the main reflects aggregate statistical information (perhaps a reflection of systems that are designed to provide rata data and not processed information), with slight attention to individual characteristics or manpower planning in a definitive sense, the development areas tend to concentrate on a movement towards information of an individualistic nature whilst still retaining the facility to provide raw data,

It is also signifificant to note that there is little currently being done or planned individually in the manual occupation areas. This is perhaps a reflection of the industries and businesses covered.There is little evidence that manpower forecasts other than in aggregate are being developed in the manual areas. Few companies collect - or are in the processing of developing the collection and use of - individual data on manual employees; the concentration being focused on staff applications, especially in the management and career development areas. Bearing in mind, of course, the diverse definitions used by enterprises when classifying employees as "staff" or "manual".

The trends in planning seem to indicate continued stress in the staff areas of more complex and more sophisticated information systems, as opposed to raw data systems. It is interesting to note in this respect that few, if any companies, are seriously considering totally computerised management information systems. They seem to view their applications as enhancing the personnel capability in the planning process but stop short of attempting a total management system. (This is borne out by Table 32 of the analysis of the Phase One Questionnaire). One tentative conclusion one could make is that for those few who plan total systems, aspirations sometimes are not wholly in accord with reality. That is, a detailed study of individual responses to the grid (not shown on the tables) seems to indicate that most of the complex, sophisticated systems are being planned by organisations with little or no experience, i.e. aspirations are in inverse ratio to experience.

We can make the following generalisations about the overall responses to the total questionnaire that are perhaps not discernible from the tables or the statistical analyses. To a certain extent these observations and generalitites are subjective, influenced as they are by experience and observation of other systems not included in this study.

It would seem that size of firm has a definite bearing on the comprehensiveness and depth of coverage of the system, whether extant or planned. This, of course, may be merely a reflection of requirements and commitment in that there is no real proof that there is an operation of economy in size. In fact there is some evidence (see Chapter IV) to indicate that economy of size could in certain circumstances cease to operate after about 20,000+ employees. The notion here being that programming, systems development and other start up costs are fairly constant.

There also seems to be a relationship between the degree of capital intensity and the collection and use of individual data. This is perhaps a reflection of these kinds of industry where the quantity and quality of manpower are paramount. Conversely there seems to be no national tendencies except in the area of labour statistics and this is perhaps not a function of the companies concerned but of the legislation appertaining in those countries.

Most importantly, most companies (and this is discussed in detail in all of the case studies), did not use any existing national coding or classification systems, nor were the manufacturers of the hardware involved in providing systems or file structures, in the sense of providing a software package that could meet a personnel information system total need. Obviously operating software,retrieval packages, statistical packages can be used in a personnel environment, and these were used where practical. This, in our view, is a sad commentary on one of the fastest growing and to a large extent the most complex of computer applications. The argument, in our view, that each company has unique problems and unique characteristics, only partially holds water.

We can perhaps end these general observations by concluding that the existing systems reflect an approach to corporate manpower management and little attempt at manpower planning or development as such, whereas the future would seem to reflect a movement away from corporate management to personal man management with more realisation of the importance of individual management manpower planning as such. This is substantiated by the stress being made on development and planning output in the form of promotion, appraisal, management and career development, welfare and training.

This focus on individual data collection to provide information does not in any sense negate the links between micro and macro systems, provided that we move towards national compatible coding and classification structures and systems. These links can be shown diagramatically as:

Micro systems	Macro needs
Quality of manpower	Education
Salary/wage	Social security
Compensation & benefits	Social security
Redundancy/turnover	Economy
Negotiation	Labour markets

There are of course others, but the above are shown for illustration only.

KEY POINTS EMERGING

Finally, some key points and thoughts for future users - whether they are recipients or creators of data:-

1. Personnel Information Systems always take longer and cost more than planned.

2. The Operational System is never exactly what was planned originally (concepts, philosophies and reality cause change).

3. Systems planned for the future are usually over-optimistic - e.g. when systems are operational finally, they are seldom as complex/sophisticated as planned.

4. The longer the period of development, the shorter the system life (this is probably a function of technology).

5. An initial decision elsewhere in the organisation to lease/buy hardware usually forces development of new or better systems for manpower. (The computer department wants maximum utilisation of C.P.U.Time).

6. With few exceptions, personnel development has not been the prime justification to lease/buy hardware. However, it seems that as personnel systems get more complex/sophisticated, these developments are tending to influence lease/buy decisions.

7. In a few instances there was not enough liaison between the user (personnel) and the technician (computer department). This is vital.

   Guidelines: It seems best to assign or second a systems man full time to the personnel department. The computer department cannot give maximum support unless requirements are known, agreed and understood.

8. There seems to be a tendency to misuse the computer - or to put it another way - not to use the hardware for tasks for which it was designed. That is, there is no indication of many new systems, either conceptually, or operationally. Most initial

applications are merely a transfer of manual systems to mechanical ones. This leads to disenchantment with the computer as a managerial tool.

Guidelines: This approach may lead to the situation where the computer system is less efficient and flexible than the manual system.

9. Unoftunately, when companies realise that full potential has not been realised, they have had to spend unnecessary resources to get the benefit that was first visualised.

Guidelines:
1) More advice and guidance could be forthcoming from manufacturers who surely have knowledge of these occurrences.
2) More exchange of experiences should be given between companies. Especially to new users.
3) The above situation has caused a considerable amount of duplication of effort - e.g. man hours in systems design and programming, development of codes, file content and structure. Although one must argue that each company has different needs, it seems that there are more areas of common problems than there appears to be.

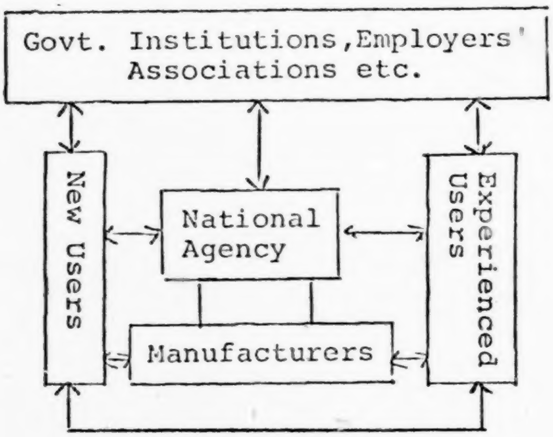
10. There is a problem about the people who make a system operate - notably the data preparation and recording clerks. There is little job satisfaction in repetitive tasks, especially if there is also a very high accuracy demand. It seems to us that this problem should be tackled quickly by the behavioural scientists.

11. Another problem is the specialist. What do you do with him when the project is operational? Companies must pay more attention to their career planning in this area or industry will lose some very highly qualified people.

12. Governments and enterprises should be working together to accelerate the facility to exchange information, e.g. by interchange of printouts and tapes.

13. Governments and enterprises must be more aware of the ever increasing legal requirements for the provision of data and take steps now to ease this increasing burden.

Our recommendation to help minimise the problem areas shown above is that there must be encouragement at a high level to increase communication both vertically and horizontally; perhaps with a central body co-ordinating such activity. The model below demonstrates this concept.


Govt. Institutions,Employers' Associations etc.
New Users
National Agency
Experienced Users
Manufacturers

CHAPTER III

THE CASE STUDIES

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: The Hamburg Power Company

CASE STUDY NO. 1

Dusseldorf, February 1971

Harald Bartelt

CONTENTS

I. Introduction
  1. The methods employed
  2. The firm
II. Fundamentals
III. The Planning Stage
IV. The introductory stage
V. Operation
VI. Outside connections
VII. Planning for the future

I. INTRODUCTION

1. The methods employed.

The material for the present case-study was obtained from a number of interviews on the basis of a standardized questionnaire. The intensive questioning found to be necessary took place between 19th and 24th October on the firm's own premises. The following executives were interviewed and the present report is based on these discussions:

1. the person responsible for data processing in the personnel department;
2. the person responsible for the processing of personnel data in the computer centre;
3. personnel management;
4. the works council;
5. the executive in charge of personnel planning;
6. the head of a production department.

2. The firm.

The Hamburgische Electricitäts-Werke A.G. (HEW - the Hamburg Power Company) is an "isolated"concern, with no regional branches and connected with no parent or daughter firms.

It is one of the biggest power-companies in northern Germany and the biggest industrial supplier in Western Europe of heat to outside consumers. The HEW supplies the whole of the city of Hamburg with electric power and big areas and industrial firms with heat, and considerable quantities of power to Schleswig-Holstein and the linked supply system. Total gross production of power in the business year 1970 amounted to 7,381 million kWh. At the time of the investigation the total number of those employed was 5,654, including 3,265 operatives and 2,389 clerical staff.

The firm has a centralised personnel policy and management and make no differentiation between salaried staff and wage-earners. Such a differentiation simply does not exist inside the firm and only needs to be considered for insurance purposes.

Personnel and welfare questions, on a par with administrative and legal affairs, are dealt with at the highest level and are the province of the directors. The main department for personnel and welfare questions on the next level controls sections dealing with personnel and welfare on the next level down. It is the head of the pay section on this level who is responsible for the EDP work of the personnel department.

II. FUNDAMENTALS

The firm has a computer section of its own, forming part of the organisation section, with one IBM 360/20 and one IBM 360/50. Personnel information is stored on discs; the pay accounting information and the personnel statistics information are still stored on tape. The moving of information on tape to disc storage is being planned.

After a year of preparatory work the system was introduced on 1st January 1964. It is constantly checked and modified, and further developed. Three people are occupied full-time on this, a senior programmer, a programmer and an EDP worker from the personnel department.

1. The firm already had EDP equipment of its own with sufficient capacity to take over pay-calculations, desirable on grounds of economy;

2. Machine calculation would mean the possibility of reducing those employed in the pay section from 50 to 20;

3. It was an openly understood aim of the management, with a view to a more efficient personnel policy, to do away with the various decentralised personnel offices and get their work done centrally;

4. Top and personnel management looked forward to getting better and more up-to-date personnel information.

To date, basic thinking is not going so far as the idea of finally and fully integrating the personnel information system with the systems of other departments in a kind of management information system. Top management could well regard such an integrated system as a desirable thing for the future, but there are doubts about whether it could be achieved.

No special problems or opposition were expected from management at least in any shape that would cause them to have to be taken into account in the initial thinking. Once the directors had taken the decision to develop personnel information they gave full support. Heads of departments however were at first rather sceptical about the standardisation of interpretation of statistics, which were no longer designed or intended to meet the individual needs and practices of the various departments, but their suggestions were taken into account so far as possible in the initial planning, and it was eventually found possible to convince them without exception of the need for standardising the statistical work.

The design of the system met with no difficulties from the organisation plan of the firm. The centralisation of personnel work, which was being planned quite separately from any idea of an EDP system, worked in well with the studies towards EDP. One change introduced was the transfer of pay-calculation from finance and accounting to personnel and welfare and its incorporation with personnel statistics in the pay-section, which logically led to a change in reporting responsibilities and channels of information. The previous system had been for each department to send up its own personnel statistics and report independently to the directors; now this would no longer be possible. It did not, however, depart from the newly accepted policy and simply formed part of basic planning.

III. THE PLANNING STAGE

In the preliminary planning stage no specific effort was made to calculate what installation and operating costs would be. An attempt was made to get an advance idea of current equipment running costs, but it later turned out that the estimates were hardly ever correct.

Today, with the system working, an exact analysis of total costs is made every month and annually, for comparison with the budget. It can now be seen that the EDP system has made considerable economies possible in the personnel department; first of all, as already stated, the number of people employed in the pay-section was cut from 50 to 20 and, again, while performance demands on the EDP equipment are going up, the hiring cost remains roughly the same, whereas the cost of staffing on the whole is strongly on the increase. Hence considerable economies, though they are difficult to put into figures.

The final decision on what data should be collected was formally left to personnel and welfare alone. This department did indeed work very closely with the appropriate EDP people in the organisation section, and heads of departments were able to notify their requirements via the normal information channel.

Personnel and welfare drew up the lines of what it expected to achieve and then talked them over with the EDP people from the organisation section. The latter then assembled the data and regulated the compass of the categories of input accordingly. Less planning went into this kind of collaboration which evolved according to needs.

Absolute priority went to the data for pay-calculation, and then came enterprise statistics etc. Today, personnel and welfare can no longer fix priorities so simply. There is a shortage of staff on the organisation department's EDP side and this means the use of various shifts and expedients.

The shape of the data to be produced was determined in the main by the output demands of personnel and welfare.

The first thing is always calculating and accounting; then come statistical notifications for government offices, statistics for personnel management and information for other departments of the enterprise. Today, eighty different programmes are working.

The decision on what input and output should be, was very little influenced by extra-firm requirements (those of statistical offices, insurance companies, banks, etc.) and no particular problems arose during the design period. At the same time, problems caused by the various locations of departments of the firm and its organisational structure were dealt with smoothly, as was also the collection and transfer of original records. The classification of the statistics to be printed out was modelled on the firm's organisational plan.

The trade unions had no part in deciding what input and output there should be. Actually, when the system was working, an agreement was reached with IG-Metall (metal-workers' union) on the exchange of a tape for the machine calculation of union-members' contributions. The works council also played no active part in designing the system, although it was kept informed from the start and called in to help decide when the monthly pay-day should be. It also gets the following output regularly:

1. overtime figures;
2. figures on absenteeism;
3. lists of appreciations of workers' performance;
4. pay-summaries, on request.

The works council on the whole is very much in favour of the EDP work being done in the personnel department, it sees it can get better information printed out and can always ask for more; and finally the workers are not losing out when the rewards of rationalisation are shared out.

There had to be co-operation between the people in the personnel department and those in the EDP section on the planning of the project and putting it to work but there were no difficulties at all. They all worked closely together as a team. The contact man in the personnel department had already had some programming experience and this eliminated any problems of communication. The EDP specialist from the organisation department was responsible for working-out methods and technical matters.

This person, a member of the firm of course, also dealt with all the coding, without any help or interference from outside; even the manufacturer of the data-processing equipment had next to nothing to do with the designing of the system and, out of the total of 80 programmes required, supplied only one programme for the calculation of monthly deductions for income tax. During this stage no attention was paid to the planning work and systems of other departments of the firm, such as finance and production and the personnel system, it could be said, developed autonomously.

The prospect of EDP planning brought hardly any changes in policy, regulations and procedure on the personnel side; EDP was taken simply and solely as an aid for personnel work and given no recognition as a formative factor. It was brought in, it is true, at the same time as the centralisation of personnel and there were changes, but it was centralisation and not the EDP system that was regarded as responsible for them. The existing method for travelling allowances was changed or remodelled when it was found that a more satisfactory method of calculation was possible with the computer.

Plans are at present on foot to integrate the available 80 programmes in a complete personnel information system, and a working group has been set up in the personnel department to look into the aims and possibilities of such a system. Its programme of work covers:

1. examining and improving all existing statistical production;
2. the possibilities of long-term personnel planning;
3. personnel recruitment possibilities;
4. remote processing of data;
5. direct access to personnel data.

The new working group is supposed to push on with organising these procedures using experience already gained. All sections concerned have to have a say in decisions, and the process of reaching decisions takes rather longer, but it is expected that adaptation problems will be less.

IV. THE INTRODUCTORY STAGE

Bringing in the new system and its practical operation was made the responsibility of personnel and welfare. Top management had given its basic approval and it now stepped aside. Managers and workers had been put in the picture about the impending changes by means of circulars, the firm's magazine, meetings and by the works council. There was no test run in any smaller section before the new system was brought in or while it was being brought in, and there was also no possibility of any parallel run with the existing manual system. From the moment of the changeover the EDP system had to be fully operative.

Admittedly, while the programmes were being produced, there had been a thorough testing of a hundred selected calculation operations, and even now there are 80 test cases which are put through each time before a new programme is put in. Putting them through might bring out smallish errors of programming and such like but this did not occasion any significant modifications of design, coding, or input or output, and also no changes were made in the objects in view or the field of application.

While the system was being put into operation there were no longer any unexpected difficulties. Hardware and software problems had been dealt with in advance, management and works council had given their agreement, and data proved to be accurate up-to-date and usable.

The main difficulty today comes from shortage of staff to operate the system, programmers and so on. In spite of this, the work-force of the concern has never had any disagreeable experiences either during the changeover or during current operation. So far, each pay-day has come and gone normally.

V. OPERATION

The system as it at present stands is still not an on-line system but a changeover to this system is being planned. On the customer-service side there has been adequate experience already of a complete on-line system. The changeover is being delayed mainly by the shortage of programmers and by the fact that the areas of application of EDP in the firm are constantly on the increase.

Basic personnel data are brought right up to date twice a month by a regular updating service, and once a month each personnel data record is automatically checked by a built-in plausibility control device.

No particular problems arose during the takeover of the relevant personnel data. Part of this was already available on cards and the material on fifty to eighty thousand cards was put onto tape. Further data were taken over from personnel files and the pay-section. New personal data on the employees, such as changes of address, married or not, etc., level of training reached, were elicited by means of a questionnaire. Personnel are obliged to notify any changes immediately. The co-operation of those called upon to report and notify was first-class.

Back data prior to the new system were not stored on tape or disc. The old personnel files can be got at any time and are not regarded as obsolete. Any change in a record is superimposed on the old record on the disc, so that the old record is deleted.

Any updating changes the file of basic information while back-references occasionally may turn out to be needed; also basic information may get destroyed. Against all this, there is a special safeguarding and retrieval procedure on the grandfather-father-son principle. Under this, every time (twice a month) basic information is updated, the previous information is transferred from the disc to a data safeguarding tape. Three generations of these tapes are lodged in a fire-proof safe. On top of this, on 31st December of every year the basic personnel information, as it stands on that day, is transferred to a safeguarding tape and this is kept for ten years in an especially safe place outside the firm.

On the whole the system has been equal to the work it was designed to do and has come up to expectations. It gives the highest priority to calculation operations and here it functions in a first-class and reliable manner. Here alone the work of 30 people was economised.

Judgement on personnel statistics produced is somewhat less favourable. The difficulties experienced since 1966 in recruiting new programmers have meant that production of statistics could not be expanded as required, so that some of the lists printed out still contain too much uncondensed figuring and do not come up to the desired standard as a management tool.

The system has proved to be sufficiently flexible and this far has taken in its stride all updatings and additions in input and output. Storage capacities were fixed so generously that, out of the 950 bits provided for each person employed, only about 800 have been utilised. The equipment for programmes could have met all changes and calls for expansion if it had not been for the shortage of the necessary programming personnel.

No changes previously unforeseen by the planners were subsequently needed in channels of information and the process of reaching and executing decisions. A lot of centralisation went on in the personnel department but the changes that took place were not a direct consequence of the new system but the basic decision of top management to do away with the outlying personnel offices. It may well be that the changeover at the same time to EDP work in the personnel department directly or indirectly simplified or speeded up the centralisation that was going on. As the centralised personnel and welfare departments are now able to direct the flow of data, and thanks to EDP, in a position to deliver better data, the other departments took second place.

By and large management is very pleased with the output data produced. Nobody is any longer basically against the system. Personnel management and the directors would like the statistical material to be presented in a more abstract and condensed shape. Heads of departments would like data that are still more up-to-date, e.g. overtime statements, or tailored to their department's needs, e.g. lists by degrees of training. Those running the EDP system in the personnel department regret that plans for using the relevant data already available, have to be delayed because the programmers available have to deal with work for the firm that must have priority. No regulations or processes under personnel policy have had to be changed as a result of operational experience gained, having been sufficiently borne in mind during planning. In any case, personnel policy has absolute priority and EDP work is not allowed to affect it in the least.

There is no integration of the EDP system of the personnel department with the systems in other departments or with the firm's planning system. So far each of the firm's systems enjoys a separate existence. Integration is the subject of long-term aspiration, so far as it can be possible and of advantage. There are some links between the personnel planning system and overall planning and between plant management and costing and cost-control.

VI. OUTSIDE CONNECTIONS

During the design period there were next to no contacts with outside bodies, government authorities or other firms, either for assistance or exchange of data.HEW did however, even at the design stage, bear in mind the possibilities of data-exchanges with others, and a certain number of data blocks were created as a reserve.

Nowadays there are contacts and a modest degree of data-exchange with outside bodies. The system assists the calculating of health insurance contributions. The Hamburg Statistical Offive gets quarterly pay-statements printed out. Remuneration certificates are supplied to the finance authority for income-tax assessment, an exchange of tape with the banks for pay and salary transfers is planned for the beginning of 1971, and IG-Metall gets a tape for its members' contribution. There are occasional contacts with the Federal Labour Board on coding problems in connection with the classification of occupations, and there will be co-operation with the pension authorities when the nation-wide insurance-number system comes out.

There was never any question of exchanging programmes or details of the design of the system. Talks took place but they did not lead to any direct exchange or co-operation. The firm's coding plan was worked out internally without any consultation with outside bodies.

There is a wish for consultation at some early date and a greater degree of co-operation, but the firm for its part does not see much chance or possibility of any greater activity on this side.

The wage agreements and the whole wage-negotiation process had a very strong influence on the design of the system. The firm has its own separate wage-scales and in negotiations is alone face to face with the unions. Input and output for the pay-system is shaped in accordance with the wage-agreement. This meant the programming of methods of payment, variable bonuses and a points system peculiar to the firm. Separate programmes are on hand, which can be put through before or during negotiations as an exercise to show what the results could be. Wage-categories, recruitment-dates and job code-numbers are fed in and combined with the possible results of negotiating, and the output gives differentiated totals according to the criteria.

This system of special programmes has turned out very much to the satisfaction of top management. This way of doing things is also accepted by the other side in the negotiations and the need to keep the wages-agreement computer-compatible is accepted for purposes of the negotiation.

VII. PLANNING FOR THE FUTURE

Bigger problems of compatibility are foreseen in the future and there is therefore a desire for timely consultation and improved co-operation in particular with public authorities including those on the legal side. The form of contacts could range from sporadic conversations to joint working groups. Top management however believes that the necessary co-ordination of firms' affairs with the authorities should rightly be shouldered by the employers' associations.

Internally, the most important thing for the HEW is the expansion of the present system into a comprehensive personnel information system with direct access.

The manufacturers of data processing equipment do not see many possibilities of being helpful in setting up compatible systems and codes or providing software programmes. The degree to which programmes could be standardised, they have said, was limited, they had to be tailored to firms' individual needs. Data checking and programme updating was for inside personnel to do and this meant that they would have to work themseleves into their duties themselves.

Among the last questions asked during the investigation of EDP work was one about the part personnel management would play in future in the reaching of decisions for the concern as a whole. The reply was unanimously that there was a trend towards a big increase in the importance of the personnel side. The upgrading of its powers and status however was not due to the EDP work in the personnel department. Those concerned pointed to the tight situation on the labour market, the increasing mass of social and economic legislation, and the growing demands of the firm on the one hand on the qualifications of those working for it and, on the other, the latter's bigger demands and expectations from the firm on the social side. Thanks to EDP work, big quantities of better and more up-to-date statistical information would be provided to help in reaching decisions, and this would mean that people in personnel would be able to see an end to part of their time- and labour-consuming work on administration and be able to devote themselves more to personnel policy properly so called and to medium and longer-term planning. EDP would take on an ever-increasing importance as an auxiliary of personnel work but it would not lay down where personnel would stand.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Ford Motor Company, Cologne

CASE STUDY NO. 2

Dusseldorf, February 1971

Harald Bartelt

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I. INTRODUCTION

1. The methods employed

The method of obtaining and presenting the information for the present case-study was the same as in the case of the HEW study. A document on the same subject by the firm served as an additional and secondary source.

The interviews found to be necessary began at the end of November 1970; after a rather long break they were concluded only on 20th January 1971.

2. The firm

Ford-Werke A.G. in Cologne, as part of Ford of Europe Inc., is an overseas headquarters company under the Ford Motor Company at Dearborn in the U.S.A. From Cologne it controls several branch factories in Germany and one in Belgium.

The firm is one of the biggest motor-vehicle manufacturers in the Federal Republic of Germany and in 1968 achieved a turnover of something over 2.500.000.000 DM. At the time of the interviews employed 47,294 people, 11,092 office-staff and 36,102 workpeople.

The personnel department at Ford's considers itself as a department which supplies services to those responsible for the firm's decisions. For this reason it is decentralised, with personnel sections coming directly under the top people in the firm and located at the place of production.

The activities of these decentralised personnel sections are co-ordinated in the personnel administration department at headquarters whose duties cover the working-out of basic principles, the co-ordination of personnel decisions, and ensuring that any decisions of principle are carried out within the latitude allowed to the decentralised personnel sections.

For the development and implementation of Ford's Integrated Personnel Information System (IPIS) project, a development team was set up in main administration, under the systems and data-processing department, with competent people from personnel departments, systems analysts and programmers. A three-man section directly under personnel management was set up inside the personnel department to look after supervision and further development and ensure co-ordination with the methods and systems department.

II. FUNDAMENTALS

The system planned was so extensive and complex that systematic analytical work and the best chance of success were found to be possible only by breaking down the problems into limited and clearly defined elements. It was thus possible to achieve partial results in the relatively short term. The four main phases of analysis and execution of the IPIS project were the following:

1. collection and checking of personnel data;

2a. collection of timings;

2b. payroll calculation;

3. planning of training, and its control and analysis;

4. personnel planning.

Today phase 1 of the system is set up. Phase 2a is in the testing stage and is working correctly. It has taken 27 man/years to prepare the system now in operation and a further 5 man/years have already been put into the systems which are not yet operational.

The existing equipment consists of an IBM 360/50 and 2314, 3965 and 2701 equipment and Siemens data-terminals. Data are predominantly stored on discs, with an additional history-tape.

There have been three main stages in the development of EDP for personnel purposes at Ford's. Work methods in the personnel department were mainly manual until 1960, when the department turned to electronics. The punched card process then set up in personnel administration and for payroll calculation was found to be obsolete by 1963 and it was replaced by a punched card/paper tape/magnetic tape system. Thanks to this, more extensive and more rational data collection and storage became possible and the print out was, to some extent, in better shape. But the problems and limitations of the system had to be acknowledged.

It was not sufficiently flexible to cover the personnel sections which had been decentralised from the organisational and personnel policy point of view. The large number of these decentralised sections made maintenance and safeguarding of the data-flow more and more difficult. The mass of data arising in a giant firm that was still expanding brought bottlenecks and problems in the collection of data, its processing and output, as well as in the updating service. The old system could not keep pace with the increasing and diverse information requirements of personnel management and its subordinates. Reliability of information was beginning to leave something to be desired. Short-term requirements of data presentations and personnel lists frequently could not be met.

These considerations and the rapid advance of EDP techniques finally brought the firm to a decision to push on with the development of a modern information system from Autumn 1966.

Technical advance had brought out the disc for data storage and a beginning was made in the use of this machine in the spare parts depot. One of the additional reasons for introducing the new machine was the setting up of a personnel data bank.

The main motive for the decision to develop an integrated personnel information system was greater effectiveness and flexibility in personnel management and personnel policy. It was of course in the nature of things at Ford's that economic considerations should also have a lot of influence in reaching this decision, but in point of fact to date not a single man has been found to be redundant on the personnel side. It is also a fact that today about ten thousand more employees are being looked after without a single extra man having been recruited in personnel.

The shortcomings of the previous system dictated the following objectives for a new personnel information system.

1. the highest possible degree of mechanisation for purposes of rationalising the work of personnel with, at the same time, extensive machine control;

2. a uniform system for all categories of those employed, management personnel, employees under wage-agreements and others, and manual workers;

3. the supply within the shortest possible time of comprehensive information for purposes of personnel management and personnel planning;

4. flexibility in programming and in output;

5. the system to be designed and constructed in such a way as to form a possible component of a management information system.

The last point is particularly stressed by personnel management but the experts in charge of the system are very sceptical about whether a management information system can be achieved at all. It is retained as an aim for the future, but no progress has been made towards it.

At first some opposition from management had to be overcome and taken into account in the planning stage. Special efforts were needed and some modifications in planning before management was convinced about the costs to be met. During the discussions a great deal was said about the handling of confidential data. Finally, although the system had to be uniform for all, every superior officer had different ideas and demands and an attempt had to be made to standardise them.

Apart from the setting-up of the section for supervision and further development of the system there were no changes in the firm's organisational plan. The reporting procedures of the personnel department remained unchanged. Actually the decentralised organisation of personnel caused some special problems at the time of designing, without however causing obstruction or itself being found in need of change. It proved possible to design a system which was sufficiently flexible to take care of the existing structure of the department and to meet any possible modifications.

III. THE PLANNING STAGE

According to the practices of the firm, the IPIS project had to be considered from the point of view of profitability. Investigations made before development was started showed that no additional costs were to be expected for the overall project and that already in Phase 1 expenditure and savings would balance. EDP experts estimated the costs to be met and these were then budgeted for. The main categories of costs were for equipment (terminals etc.),development, running-time and conversation. Work then proceeded on budget lines.

It was subsequently found that it was difficult to make any precise estimate of costs. It was particularly difficult to decide how to allocate them. A preliminary survey indicates that cost savings are not to be expected. On the other hand it is already clear that, with the system working, a considerable increase in the numbers of those employed (plus 10,000 to date) can be dealt with without additional expenditure on personnel administration.

The decision on what data were to be collected was left to the development team. The dominant consideration was the output required and this was ascertained from the heads of the various departments and discussed in an output committee. A proposal-sheet setting out lists and statistics was produced and circulated to personnel sections for observations.

The team members from the personnel side preferred output data likely to make the replacement of personnel card-indexes and files possible. Always with an eye to costs, a final priority list was worked out based on the proposals of personnelin collaboration with the EDP experts. The scope of input categories was determined by the output required and input priorities by what the system could cope with.

Extra-firm requirements had to be taken into consideration in deciding what input and output should be. Weekly notifications of engagement and dismissals were provided for the Employment Office on the latter's forms, and a form-letter printed-out for the factory inspectorate under the law on ante- and post-natal care. The computer was also to take care of all other requirements arising under law or wage-agreements.

The various locations of the firm's departments did not influence the decision on what input and output there should be. They did influence designing insofar as it was decided, because of the decentralisation of personnel, to have an online system with data terminals. The branch works in Germany are fully linked up with the system, but not the Belgian works; this was because of the completely different conditions imposed by legislation and wage-agreements.

The organisational plan of the firm had no influence on what input and output data there should be nor on the design of the system.

Similarly the trade unions had no possibility or influencing the development of the system nor the choice of input and output data. The works council of course had been kept informed from the beginning and a special agreement was reached with it giving it the right of collaboration, which it has used. As a result of its suggestions, confidential data (on reprimands, distraints, and such like) are input but have not yet been printed out. It gets regular output of lists of sickness absences and pensioners, job lists and monthly classification checks, a list of classification amendments, a wage-average list, statistics on the structure of the labour force, and a list of reprimands to be annulled. Other data can be called for over a data terminal to which the works council, not having one of its own, has access at all times.

The works council is on the whole in favour of EDP, since it has its special output regularly printed out and can make further requests and since the guarantee which the agreed collaboration gives ensures that EDP will not be used to the detriment of the workers.

All coding was worked out inside the firm by its own experts. No outside influence was permitted on development and the final shape. External codes are stored in registers and so are transferable. The manufacturer helped with the lay-out of the machines but had nothing at all to do with system design, development of software or finding solutions to coding problems.

No reference was possible during the design stage to the planning work and systems of other departments of the firm. Payroll calculation is under the finance department and some consideration had therefore to be paid to that department's system, but no assistance was forthcoming from that side.

EDP planning and activity did not cause the slightest change in the principles and aims of personnel policy; guiding principles of personnel policy at Ford's are supranational and are therefore not affected by EDP in Cologne. As a matter of fact, with EDP coming along, all local personnel rules and procedures were re-examined and, where necessary, remodelled to fit EDP. This resulted in a complete change in recruitment, transfer and dismissal procedures, in elimination of all manual work, in a reinstatement of controls, in a new factory-card for clocking-in, and in each person employed getting an extract from the data on him in storage.

At this moment Phase 1 is concluded, Phase 2a is in an intermediary stage and will finally be set up in the spring of 1971. Stage 2b is marking time and waiting for the publication of legislation that has been talked about. Phases 3 and 4 are still in design stage. An attempt is being made to bring in the four phases in the smallest possible sub-stages. Experience has made it clear that you cannot theoretically design a whole system and then bring it in on a fixed date. It is hoped to have the whole system working in 1975.

The team work has been very successful and will be continued. There have so far been no difficulties of co-operation between personnel and EDP people in the team. At the beginning there may have been some difficulties in communication but since then a jargon and behaviour patterns have been worked out and working together has become very productive and decidedly pleasant.

IV. THE INTRODUCTORY STAGE

Phase 1 was brought in only after every one in the firm had been thoroughly informed. Management had been put in the picture by the process of reaching of decisions and by means of various exposes. Personnel sections were given service and working instructions tailored to the system. Personnel officials were familiarised with the system and the specialised apparatus, including terminals, in operator courses. The works council had been kept in the picture from the start and had set up its own IPIS committee; it has been able to study details of the system and is now authorised to participate in meetings in which superior officers are informed. Personnel had been familiarised with the system and its rules at meetings addressed by top management and the works council, and with the help of the firm's magazine, leaflets and posters. Any one of them can get any special details from the personnel service and the confidential office of the works council. The latters says that the system is overwhelmingly accepted by all personnel.

During the introductory period there was no special dry run in a small section. Of course, the systems before they were brought in were thoroughly tested out for a month with about 600 actual personnel data items. During this dry running, output defects (e.g. in presentation of lists) were noticed and put right, but there were no more changes in design, personnel policy, rules and procedures, or codings, etc.

After start-up there was no exact parallel run with the old system. During the three-month changeover period, however some overlapping was unavoidable and at times three systems were running together; payroll was still being dealt with by means of the old system's cards, the changeover from the old system to the new was going forward with the help of student trainees, and at the same time data were put on disc via terminals direct.

No special unexpected difficulties arose either during or after start-up; hardware and software were up to all demands placed on them, management and works council had reached agreement, output data were more accurate, more up-to-date and more usable than those of the old system. There was something of a bottleneck because of a shortage of qualified EDP personnel and for a longish period work had to be done in special shifts.

V. OPERATION

The system as it stands at present is an on-line system which can keep stored data at all times up to date. The personnel data needed were obtained and taken over in various ways. Part of them were in the old payroll and simply had to be transferred. Another part had to be extracted from personnel files and was coded and then punched by the trainees. The rest of the information required was obtained from the personnel by means of a questionnaire.

It was particularly difficult during the conversion period of almost twelve months to keep data already coded up to date, but there was good co-operation with those reporting and the personnel co-operated willingly.

There was intensive discussion of the safeguarding of confidential information about this system. Experience has proved that the new system guarantees a higher degree of security than is possible with conventional administrative methods.

Firstly less people have access to confidential information; next, the channels and time taken for transmission of confidential information in the firm have been shortened; and finally, technical devices ensures that access to information in the computer from each administrative department and each terminal is restricted to the information for which that department is responsible. Data input and output for the management can only be obtained if certain passwords are used so that only authorised persons have access to the data bank. Finally there is an internal record of who has contacted the data bank,which terminal was used and what information was requested.

A limited amount of back data from the time before start-up have been taken over. Data on schooling and training of personnel have been fully included; for job and pay data information goes back to 18 months before start-up. The last updatings are stored on-line and the last 16 off-line on tape. At the end of each year all basic data on people who have left the firm are transferred to a separate tape (history tape) for storage. Basic data on everyone in the firm are kept in the names register and will be preserved in archives for 10 to 20 years.

Current updating daily changes the data on the disc, while back-references may occasionally be necessary to previous files and at any time retrieval operations have to remain possible; for these reasons the whole content of the master file is transferred each day to a date safeguarding tape, and these tapes themselves are safeguarded weekly by the same process. In addition, the copies at the terminals are available for back-reference and any necessary retrieval operations.

Where the IPIS system is in action it has completely fulfilled what it was designed to do. Those concerned are particularly satisfied with the up-to-dateness and accuracy of the output. Unfortunately, the output has not reached full capacity because of the shortage of EDP personnel. 150 different printouts are possible but for the time being only about 80 are being fully used.

The system has proved sufficiently flexible to take care of any desired changes in input and output. The disc storage capacity of 2298 bits per person employed has not yet been fully utilised, and output with the assistance of a standardised and a non-standardised output routine generator can deal with individual wishes. The IPIS team is convinced that with the existing program equipment they are capable of meeting any requirements for change.

No subsequent changes were needed in information channels and the decision-reaching process other than those foreseen at the planning stage. Changes there were, but these had been planned for.

Data flow had previously been from personnel sections to personnel headquarters sections in the main administration, but now it is in exactly the opposite direction. From the computer it goes first to headquarters and is then distributed to the sections. There is therefore now centralised production and management of personnel data but this has not affected the previous distribution of personnel work between headquarters and the outlying personnel sections. One result is that headquarters are now in a position, thanks to the computer, to carry out their control duties more effectively.

Generally speaking, management is very satisfied with the information supplied. More exact decisions can be taken since, thanks to the computer, numerical and cost effects can now be closely calculated in advance. The adoption of the new methods of data preparation and presentation caused some initial problems as computer print and codes could not be read. In addition, management expectations were pitched unrealistically high and more information was required than was actually needed. Since then this has settled down to a proper level.

The accuracy of the output is particularly praise worthy. It is rare for errors to occur or to remain undiscovered. During input there are automatic checks for format, plausibility and completeness. For one setting up operation alone, 260 checks are provided for. Operational experience showed no further need for changes in input procedure.

Personnel's EDP system is not integrated with the general planning system. Personnel planning work will only become possible when Phase 4 is brought in. There is also practically no integration with other departments' systems. Printed out information of course can be given at any time and in any quantity to other departments, but direct connection is possible only to the finance department's system and this for calculation data in connection with payroll and travelling expenses.

VI. OUTSIDE CONNECTIONS

The personnel information system has been adapted sufficiently to make it possible to send out information to extra-firm bodies and public authorities. Lists of engagements and dismissals are set up for the Employment Office, statistics are printed out for the local Statistical Office, and there is a regular output for the Factory Inspectorate. An exchange of data carriers with the Federal and Land Insurance Boards is either being planned or already in force. The need to send out such information was very largely borne in mind at the time of the designing stage and any further demands can be built in subsequently.

There was never any question, nor will there be, of programs or details of the design of the system being exchanged with other firms, authorities or employers' associations. At most there is occasional contact with other firms for exchanges on experience gained; a leaflet in German and English has been brought out for public information and in the same context meetings are arranged to put the public in the picture, but complete programs and big pieces of the design picture have not yet been released to outside people. The firm might eventually be prepared to sell such information and details.

Codings were all worked out inside the firm without any consultation with outside bodies. Fords have not yet had anything to do with compatible codings but it is assumed that the nation-wide insurance number systems will lead to appropriate coding and a separate tape is already set aside. The firm's own codes are in their own registers and outside codings can be co-ordinated with them as necessary.

Ford's as a firm has not yet made any attempt to influence the setting up of codes in State or other public authorities, but there is a contact through the employers' associations and an attempt has been made to secure compatibility in the codings being worked out for occupational classification.

The design of the system was not to any great extent influenced by wage-agreements. The construction of the system, input and output and codes have been kept sufficiently flexible to enable all developments on the social front to be coped with. It goes without saying that all statistical printouts on salary and wage structures etc. are in conformity with pay-agreements, and at the same time original design as such as to take care of change, and any modification of agreements can immediately be put through the machine for transfer.

Conversely, EDP work in Ford's personnel department has absolutely no influence on the shape of pay-agreements or on wage negotiations. It would be most agreeable if wage agreements could be framed compatibly with the computer, but the negotiations are not conducted by Fords but by the relevant employers' association which also has to take the interests of other concerns into consideration.

VII. PLANNING FOR THE FUTURE

Bigger problems of co-ordination and co-operation can be seen ahead. Attention is, however, focussed on the problems inside the firm, e.g. those of integrating personnel planning work with the planning system of the concern as a whole. Those who were questioned consider complete compatibility with other outside systems unlikely, since individual systems and their problems can only be studied and solved in a manner specific to the firm they concern. Such co-ordination as may be required, they say, can be achieved through appropriate codings.

For the same reason data processing equipment manufacturers can only collaborate to a limited extent in constructing compatible systems and codes. Only those problems which are peculiar to firms and not of general application can be solved and it is therefore not to be expected that computer manufacturers can provide standardised designs or portions of systems; on the other hand, rather more help can be expected from them with software programs.

The concluding question was on the future role of personnel management in reaching decisions concerning the firm as a whole, and the answer received from all was that personnel policy would become an increasingly significant part of the policy of the concern. This increase in importance however was not attributed by all to the existence of EDP work on the personnel side. It is true that EDP work gives greater possibilities of reaching accurate decisions at the right time, but the increasingly important role of personnel management is attributed to the overall labour market situation, to the social and political development of labour as a production factor,to the increasing attention being paid to costs and costing, and to the planning activities on the personnel side.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Siemens A.G.
Munich and Berlin

CASE STUDY No. 3

Dusseldorf, February 1971
Harald Bartelt

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I. INTRODUCTION

1. The methods employed

The information for this case-study was compiled by the same methods as the two preceding studies. In this case also a publicity hand-out by the firm was available as a secondary source of information.

The stage reached by the system at Siemens was the reason for dispensing with any questioning of representatives of the works council, personnel planning and a production branch. The necessary meetings took place on the firm's premises between 26th and 30th October 1970.

2. The concern

The concern comprises Siemens A.G. in Munich and Berlin and companies at home and abroad with more than 50% of the capital held directly or indirectly by Siemens A.G.

Siemens is an electrical engineering concern with sections for construction material, computers, power-plant, electrical fittings and medical and communications equipment; it has central departments for management, finance, personnel, engineering and sales. Its German turnover in the business year 1968/69 came to about 8.400 million DM.

At the time of the investigation, the company was employing in Germany 73,614 office workers and 132,293 workpeople all to be covered by the EDP system.

Personnel affairs are dealt with on three levels, in the headquarters personnel department, personnel sections in each manufacturing section and each central department, and personnel offices in each factory or workshop.

In the Siemens headquarters the main personnel department is immediately under the board of directors and deals with policy matters and co-ordination of personnel matters. The IVIP (integrated processing and information system for personnel data) planning group is supervised and controlled by the main personnel department and by the central management department as part of its responsibility for organisational matters.

This planning group includes qualified people from the main personnel department and organisation and DP specialists, the latter being under the main organisation section in the central management department, with the result that the members of the group are subordinate to two different headquarters departments. At the time of the investigation they numbered eleven. Their responsibility is for planning and implementing the personnel data information systems. The group is headed jointly by one person from personnel and one from organisation and DP. Concern-wide co-ordination of EDP work is the business of a special planning committee with members drawn from headquarters departments and the various manufacturing sections.

II. FUNDAMENTALS

The Siemens integrated processing and information system for personnel data is still in the planning and development stage. They have not yet had any experience of running-in and operation and the interview questions on this stage had to be abbreviated or adapted. The system of classification for evaluation was however adhered to, in order to avoid changing the internationally standardised case-study pattern.

It was at the instigation of the German planning group "Personnel and EDP" that EDP planning and activities were taken up in the Siemens personnel sector; as the firm itself is a manufacturer of data processing equipment it was hoped to obtain particularly interesting information in spite of the project itself being only in the planning stage.

It is planned to carry out the IVIP project in the four following stages:

1. (preliminary stage). From 1 October 1971 the personnel data, as called for by the list of required personal details set up, will be stored in an IVIP data bank and held at the disposal of the management. A month later, delivery will begin of interpretations connected with the firm's structure, generally standardised but specialised as and when called for.

2. The year 1973 will see the introduction of a well-thought-out and standardised data input system and the automation of administrative work. This will be working as a pilot-operation from the preceding October. As part of the gradual introduction of this standardised data input system the range of personal details to be dealt with will be finally and definitely fixed. There is also a proposal for bringing in at the same time a standardised personnel accounts procedure of interchangeable segments.

3. From 1974 models and programmes in interchangeable areas for the pay developments, the planning of personnel costs etc. will be available in the data processing system.

4. In this fourth stage there will be further extension of personnel planning and recruitment, in co-operation with a management information system, and improveemnts of the system, in particular by means of more extended use of man/machine interface.

At the centre of the IVIP data processing system are the data banks storing all necessary personnel data. Each manufacturing section can set up a data bank for its works and workshops. A data bank can also be regional and operate for the Munich area or for Berlin. A data bank may be shared by a number of manufacturing sections or headquarters departments. It is expected that IVIP current operation will go on in seven computer centres and that about 300 data terminals will be needed.

Selected personnel data, possibly in condensed form for headquarters interpretation will be made available from the individual data banks via a data bank link network.

The machines to be used are Siemens 4004/45 G machines. It may be that DP machines already in place will be those used, provided they come up to the requirements being laid down in respect of machine equipment. There will be a total requirements of 262 kilo-bits (KB) per DP machine. The IVIP system will need 131 kilo-bits for storage, data-retrieval and for dealing with dialogue, but a further 131 KB are required since at the same time as dialogue, other programmes will be processed.

In its final form, the list of required personal details will have about 900 heads with a total of about 3000 positions. The data will be stored on disc and magnetic tape. Of the 900 heads 527 (58%) can already be supplied by the machine or can be ascertained from it.

The main reasons for deciding to set up an EDP system for personnel matters were as follows:

1. provision of aids to decision-taking in personnel management.

With the growing shortage and cost of labour, there is an ever greater need to ensure that all decisions taken in the personnel field are based on information which is comprehensive and always up-to-date. This is particularly applicable to the management of personnel by leading personnel at all levels, particularly management of the firm, those in manufacturing sections and central departments, in connection particularly with recruitment, selection and promotion, pay development and planning of personnel costs.

2. provision of aids for decisions on questions of principle.

EDP will provide quicker and better assistance in the many decisions on questions of personnel training and social policy, required by legal measures, the unions or the firm itself.

3. rationalisation of personnel administration.

In the present labour-market situation, the emphasis in personnel work will have to be shifted to planning and development and supervision of those employed. This would mean an increase in the numbers employed on personnel matters unless all routine personnel work were automated and administrative work limited to the collection and management

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of the necessary personnel data.

With planning on the lines described, we could, in theory expect that it would be possible in the final stage to achieve complete integration of all the firm's systems in a management information system. However, for reasons of capacity and because of the varied types of organisation in the firm it is planned to introduce IVIP as an independent subordinate system. It is considered that adequate solutions have not yet been found for the problems connected with an integrated management information system. For these reasons it is not system integration but data integration that is being sought, with input into the overall system a one-time operation and selected and, so far as possible, processed data being transmitted to other systems. Useful experience is available to other sectors of the firm and can be drawn on by personnel.

Management's attitude to the proposed personnel information system varied. Top management at first had some reservations as to the cost but after a detailed estimate of costs and benefits had been worked out, they did not take long to come round and there is now agreement between the IVIP team and top management on objectives. The only changes in planning were in respect of dates.

Middle management on the other hand had stronger doubts and these had an effect on planning. The various sectors of the firm had relative independence and they feared too much central control. It was therefore decided to decentralise data storage, with a data bank link system to allow general access, each sector of the firm having access as the result of a mere technical arrangement. The confidential nature of personnel data is preserved by restrictions limiting the right of access to certain specific categories.

During the period of preparation the existing organisational structure of the concern and the structure and reporting powers of the personnel side posed no problems, and no changes were entrailed because of EDP planning. As a matter of principle EDP has no privileged position and is regarded merely as a service which must constantly adapt to existing structures. If any structural changes are made, it is only because systems analysis has shown that the structure is a wrong one and not because EDP wants it.

While it is not intended to alter the formal organisational structure, it is nevertheless considered that there will be considerable changes in the various individual activities on the personnel side. It is also expected that the installation of the DP system will lead to closer integration of personnel sections dealing with clerical and manual workers and to a more logical functional organisation of the various personnel divisions. These changes were in any case foreseen by the headquarters personnel department and IVIP merely reinforces what is already on the planning-board.

III. THE PLANNING STAGE

The decision to install a data processing and information system for personnel work was promoted by considerations not only of greater efficiency and flexibility, but also of profitability.

A detailed estimate of gains and costs was made, without taking account of imponderables such as improvement of aid to decision-making and the advantages for the sales side. The costs of personnel accounting were also not included on the assumption that the new concern-wide standardised accounting system will not be more expensive than the various accounting procedures previously done with EDP.

The estimate of costs covered:

1. Investment costs, including personnel costs for the development and start-up of the system (160 man/years for planning, system analysis and programming), and machine-costs (for unit and system checking and fundamental testing); equipment investment, initial (approximately 300 data terminals) and for expansion of existing DP equipment (big-size disc storage units).

2. Running costs. It is interesting not so much to know what the overall operation of IVIP will cost as to study what the extra annual expenditure and savings will be in comparison with the existing manual and DP procedures. Increased running costs will certainly be incurred for management and supervision and for further development, the appropriate share of costs of data transmission lines, and the cost of hiring equipment for dialogue and processing; depreciation and interest charges come in here too.

3. Annual savings. Estimated annual savings were set against the costs of investment and operation. Careful estimates show that automation of administrative tasks and the reduction of staff employed on supervision of the 20 existing DP procedures, would release ten per cent of this staff for other work. In addition, direct input of up-dating and messages over data terminals brings considerable savings on punching and checking. Comparison of extra annual costs with annual savings shows an annual net saving which will enable investment costs to be covered in three to four years and this leaves out of account the fact that EDP procedures are freer of problems and in respect of quantity than are conventional procedures and that labour costs are constantly increasing, while equipment costs, on the basis of the price-performance ratio, remain constant.

In deciding what data should be collected, as many departments and sections are brought in as possible, provided that this does not unduly delay the decision-making progress. Up to now it is mainly central departments for personnel and administration, in agreement with the personnel and organisation sides of manufacturing sections, that have been concerned. At factory level, discussion and agreement generally take place inside the walls with the organisation offices on the spot.

Once there is agreement, the members of the IVIP team from the personnel side lay down the final overall shape of input categories. In this they are guided by a list of required personal details that has been in existence since 1966. Working on this list gives 90% of the required data on training, fluctuation, personal characteristics, and structure, etc. Collection of data was actually carried out in twenty different procedures which are to be made utilizable along uniform lines.

Input priorities are mainly decided by the information value of the output desired. Highest priority goes to condensed material going up to management and specific one-purpose presentations going down. Storage capacity only influences priorities in the case of historic data; for this capacity is not unlimited, although it is unlimited for data that is up-to-date.Short term projects always have priority over longer term ones.

The character of output is mainly determined by the demands made by the personnel services on reporting, including structural interpretations. Top priority of course goes to personnel accounting; apart from this, there will however, no longer be any question of priorities for output, since the aim is direct access to all personnel data and any desired link-up required.

The determination of input and output is influenced by extra-firm requirements where data exchange with outside bodies is provided for. Planning covers exchange of print-outs and data carriers with the firm's own auditing and trust company, Federal and local insurance bodies, the Federal Labour Office, with Statistical Offices, health insurance offices, banks and the firm's own building society and others.

The decision about input and output was influenced particularly by the manufacturing branches. The concern is so big and the personnel sections and offices (numbering about forty in factories and subsidiaries) are so widely scattered that transmission lines for data transmission were indispensable, as was also decentralisation of processing and the delivery of the massive output, while the situation also called for a regional arrangement of data banks with a data bank linking system.

The trade unions up to now have had nothing to do with the shaping of input and output data. Wage negotiation settlements are covered by the system. By virtue of its rights under the law on the organisation of firms, the works council has been kept informed about the planning in progress.

Printouts can be done specially for the works council and the service is prepared to meet its requests and to print out the tables of figures it asks for, but at the present stage of planning the works council has no active part to play. When planning has got nearer the stage of implementation, detailed information will be provided for and there will be close collaboration with it.

The co-operation between personnel and data processing staff has not caused any difficulties. In fact, it is recorded, it could hardly have been better. Most of the prople from the organisation and DP department had already worked for personnel and the personnel experts on the team had all been concerned in bringing at least one procedure into being. Each side as a result started out with some idea of the special problems of the other and could understand the other side's jargon.

The codings required are all being worked out inside the firm, without any direct help from outside or any taking-over of ready-made codes. Nationality codes, insurance numbers, taxation categories etc. have, however, been planned on the lines of outside models. The very considerable lack of outside codes is regrettable and those concerned in the firm would very much like to know what codes government authorities and other bodies have, since co-operation is necessary and data-exchange desirable, and the final shape of codings being worked out in the firm could and should of course be influenced by what is going on outside.

While the system for personnel is being developed, increasing attention is being paid to the systems in other departments such as finance, production, market research and sales, in accordance with a regulation applicable throughout the concern requiring that the systems set on foot by the various project groups should be at the service of all other subsidiary systems. Siemens being a manufacturer of data processing equipment, the sales side is particularly interested in the development inside the firm of subsidiary systems of the large interchangeable component type and their co-ordination one with another, and takes note of these programmes in order to help customers seeking solutions to their software problems.

The requirements of the top level staff for data retrieval particularly influenced the designers. Management demanded up-to-date data, rapid access, and interchangeable link-ups; the system was designed to meet these requirements and provides for access by means of visual display units to be set up wherever they are needed.

When the system is finally in action with facilities for direct access and the arrangement for linking up the scattered data banks, changes in information channels will be inevitable, but in no case will EDP planning cause any changes to be made in personnel policy; data processing is essentially an auxiliary for the presentation of alternatives in decision-making. It is never intended to obstruct or to influence existing policies. There will only be changes in the administrative rules and procedures in force to make them compatible with DP.

The experience gained to date has shown no cause to make any changes in the way the IVIP project is organised. The present organisation has in fact stood the test particularly well thanks to the planning bodies set up, i.e. the planning group and the planning committee, and the idea of implementing the project in stages within each of the four planned stages has proved satisfactory.

Detailed planning and implementation of the project is in the hands of the planning group, composed of people from the headquarters personnel department concerned and specialists from the organisation and DP department. The members of the planning committee, with representatives from the manufacturing sections, get together occasionally and take their part in making decisions. In addition, they act to advise, inform and co-ordinate.

As already said, each of the stages for seeing the project through is split up into phases and the following method of working has proved best: defining priorities for action, with short-term objectives in principle taking precedence over long-term objectives; working out a planning concept for each individual objective; setting out in black on white exactly who does what; programming, test run, introduction, consolidation. And up to now there has been no reason to make any changes in this method of operation.

IV. THE INTRODUCTORY STAGE

At the time of investigation this stage had not yet been reached but planning provides for the first basic data to be stored and available by 1st October 1971. This was why a selection had to be made from the subjects listed in the investigation scheme of those problems on which relevant information could be obtained from the planners. As there could be no reference to experience gained during start-up more attention was given to what was expected of the system after start-up.

It is planned, as soon as possible, before the launching of Stage 1, to start an information campaign inside the firm to reach the largest number of people possible. Written descriptions of the project for the various levels of management in various degrees of detail are already available. The campaign will reach down as far as the administrators and may extend to the training departments. The works council and the employees are to be familiarised in detail with the advantages of the system so that any eventual inconveniences may not be over estimated.

There will be a through test-run prior to any phase of start-up, and at present the first selected portions of data bank are running on test in two smallish sections. At a later stage, as each successive phase is introduced, there will be parallel operation, with a maximum of six months for each portion of the project in one or two personnel sections, followed by a maximum of one month in each of the personnel sections.

The volume of information to be supplied to various levels will vary, according to their actual needs and to economic considerations. There will also be a system of supplying recipients in turn, but the basic principle will be to put on the desks of managers, and also of administrators, as little paper as possible in the shape of printouts. This is why planning provides for visual display units, making it possible at any time for individual calls for data to be made direct and answered by return over a routine output generator system. Printouts will be provided only for specific purposes.

No particular difficulties are expected at start-up. Hardware problems should not arise, the equipment being home-produced. The software required is still partly under production and there could be problems about delivery-dates because of the shortage of the right type of programmer. It is expected that the data supplied will be much more accurate and up-to-date and better utilizable at all levels than those supplied by previous systems.

It cannot yet be said what changes may be necessary in design, codes, and input and output, after the test and parallel runs. It is not expected that any great changes will be needed, as apart from small corrections of programming errors, none were found to be necessary when the existing accounts procedure was set up.

V. OPERATION

The remarks at the beginning of the preceding chapter obviously apply here too, since there is no experience of actual operation, and consequently the interviews dealt mainly with planning and expectations.

Long-term planning being for an on-line system, from the moment of start-up data can constantly be kept right up to date; this will also apply to data sent out. During the preliminary stage up-dating will be done off-line once a month.

Most of the relevant data are already in store and the remainder will be obtained from personnel files and a questionnaire filled up by management personnel and the rest of those employed. This proceeding is not expected to raise any difficulties for the system but may take quite a lot of time as there may be delays in getting the papers back. Co-operation of reporting services, during operation, will be automatically stimulated by the fact that each authorised requester of data will be able to get up-to-date and complete information only if there is punctual reporting from all. Problems in connection with confidential information will be solved by proper definition of the right of access and in special terminals or by the requester announcing his identity and giving a password. The few processing specialists concerned are pledged to secrecy.

No decision has yet been taken on how historic data will be dealt with before the system is started up. It may be that each man's career and his progress through the various grades will be recorded, in any case such data will be put into store on each member of management and management trainees. The man's career development, classified by skills, will be put into store for at least ten years, if not indefinitely. Those who have left the firm will have a mini-record until they reach 65. It is however being considered whether such information should not be taken out of the system direct on to microfilm.

It is firmly assumed that the system will fulfil what it has been designed to do. It will in any case be more economical than conventional methods.

Precaution against the risk of data-carriers being destroyed or lost in any other way is being planned in the shape of safeguarding magnetic tapes on the son-father-grandfather principle.

At the stage which the Siemens IVIP project had reached the next questions on the interview questionnaire could not be answered, and it was not possible do to more than take note of the following points.

The system's flexibility and its ability to take care of subsequent modifications and additions to it are guaranteed by the large-components technique, documentation and clarity of prgramming etc.

An attempt is being made, by means of output routine generators and models that can be linked up, to limit the danger of having to make changes in programming equipment as a result of changes or extensions in the scope of input and output.

The mode of operating the system will have no effect at all on centralisation in personnel work. It is probable however that there will be changes in job-structure inside some personnel sections or in the duties of certain employees as a result, for instance, of a data terminal being put down in the section or of administrative work changing towards work on care and supervision of personnel.

An attempt is also being made to meet any possible opposition from management by the storage of all relevant data, continuous on-line updating, good presentation of output data with the help of report generators and visual display units, terminals, free availability of all personnel data, avoidance of incorrect data by means of built-in checking routines and sight verification at the input point.

Operational experience will not lead to any changes in personnel policy. This is a sine qua non.

The IVIP system is integrated with the overall planning system to the extent that it works simultaneously with other subordinate systems and must be integrated with the overall management information system.

There is no plan for its integration with the firm's other functional systems, e.g. the accounts system, but there is data-exchange and there are agreements on delimitations of areas.

VI. OUTSIDE CONNECTIONS

The thinking underlying the system provides for the possibility of supplying information to bodies outside the firm. The recipient's possibilities will be taken into account as far as possible, but exchange of machinereadable data-carriers is considered to be the most suitable practice. In principle the firm is prepared to exchange data with anyone who approaches it in this connection. Exchange of data with banks and authorities such as the Federal insurance offices is already beginning.

It is planned to exchange with subsidiaries and connected firms complete programmes and documentation on system-design. In certain cases help would be given to outside firms and authorities or employers' associations. Exchanges of operating experience are also foreseen by the planners.

Up to now all codes have been worked out inside the firm, but it is hoped to achieve compatibility with codes used by other firms and bodies. Compatibility is regarded as most important and the fact that each firm and each public authority works out its own coding is a matter for regret. A beginning of co-ordination is seen in the EDP team set up by the Deutsche Gesellschaft für Personnelführung (German Personnel Management Society); people from Siemens regularly meet representatives from other firms to work on problems. The firm, together with the associations it belongs to, has also been trying to persuade government authorities and other public bodies to let it have a share in working on their codings. This has resulted in work being done together with the Federal Labour Office on the elaboration of the list of occupational categories and on the working out of the codes for job-descriptions. There have also been talks under the aegis of the employers' association on the projected new individual insurance number system and discussions with the Federal Ministry of the Interior on the plan for personal identity registration.

While the system was being built up, it was not allowed to be influenced by wage-agreements, but the character of input and output has had to be closely considered in view of the necessity of provisions of wage-agreements being kept computer-compatible and logically this has also had an influence on codings. Conversely, endeavours are being made with the help of the competent section of the firm to ensure that new wage provisions are automatically processable.

In a special endeavour to facilitate the complicated business of wage-negotiations, the system comprises a simulation-models procedure to tie up all the data coming up in the course of the talks. Data on wage-levels, special rates for certain localities, wage-categories, calculation-formulas for annual holidays, overtime, and high-capacity performance, and details on reduced-rate categories and extra pay for special working conditions are fed into the machine and programmed, facilitating calculations of the highest complexity and presenting theoretical results before and during the wage-talks. This enables those negotiating to know more accurately where their claims and suggestions are leading and the problems can be looked at objectively.

VII. PLANNING FOR THE FUTURE

Increasingly difficult problems of co-ordination and co-operation are expected and Siemens would be prepared to collaborate with companies and authorities who were interested. Co-operation on system design could go as far as the setting-up of joint working groups or to work sharing. The purchase and sale of system-designs is envisaged and the firm is therefore ensuring that its own system-design follows the principle of large components for interchangeability. If appropriate collaboration could be started, the experience of big concerns could be put to use for helping small and medium-sized firms. In the interest of getting compatible codes for working with government authorities and offices, the firm wants the associations to arrange contacts without delay between government and users.

Siemens as computer manufacturers feel particularly responsible for seeing that compatible systems and codings are brought out but consider that it is the associations that should arrange the necessary contacts. As manufacturers they have set their faces against any direct lobbying of government offices or parliament.

It is declared policy, and of course competition requires it, that computer buyers should be helped as far as possible in finding solutions to the software problems they have to face, and great endeavours are being made to extend the range of software offered to cover program systems.

Personnel management will be called on to play an ever increasing part in reaching decisions affecting the concern as a whole. The reasons for this will lie in the first place in the labour market situation and outlook, in the increasing importance of labour, as a production factor for economic growth, in the greater complexity of industrial relations and in labour increasing claims in the social fields. EDP will help to make it possible for the personnel side to meet these higher expectations and greater responsibilities. It means relief from routine work and provides management with more up-to-date, more comprehensive and better presented information. EDP work cannot claim credit for the increased importance of the personnel side but it does help it to carry the heavier load it is having to shoulder.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: S.A.A.B. - Scania, AB

CASE STUDY NO. 4

Stockholm, May 1971

The Swedish Council for Personnel Administration -
District of Stockholm

Kiell Janson
Bengt Linder

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1. BACKGROUND

1.1 Description of the Company - its Organisation and Production

SAAB-SCANIA AB carries on its principal operations in Sweden even though there are some ten foreign subsidiaries in the Group.

The Group is organised in four product-oriented divisions and some common supporting services or staff units:

1.	Automotive Division Sodertalje	The largest division in terms of sales. Production consists of passenger cars, trucks, buses and diesel engines.
2.	Aircraft Division Linkoping	Includes the manufacture of planes and certain missile systems.
3.	Data Processing and Electronics Division Linkoping	The computer segment mainly consists of systems D 22 and D 220 as well as a newly developed terminal (D5). This division also produces monitoring systems for hospitals.
4.	Nordarmatur Division Linkoping	Controls systems for process industries constitute the main line of production in this division.

Sales and number of employees:-

The Group grosses annual sales of about SK3 3,000 million, of which exports account for about 25%.

SAAB-SCANIA AB employs a total of 28,000 persons, 7,800 of them in Linkoping, where the head office is situated.

This case history primarily relates to the units round the head office, where the 7,800 employees consist of 4,600 salaried employees and 3,200 manual workers.

SAAB-SCANIA AB is a high-technology firm whose development programme and manufacturing cover aircraft, cars and computers. All this requires a varied and highly qualified personnel.

Well-developed systems of long-range personnel planning are accordingly needed especially as in Sweden firms must show responsibility to the community at large. Organisationally, the personnel department for the Linkoping area is subordinated to the Group staff function, Personnel.

The data service sector (which includes the systems department) provides a common supporting service for all divisions even though it is organised under the Data Processing and Electronics Division.

1.2 Preconditioning Factor

Some essential factors which have affected the Company's development level, especially on the personnel data side should first be mentioned.

The Company's recent structural change has had a decisive impact on the course of events in this respect.

The two dominant factors have been (1) the merger of the two firms, SAAB AB and Scania-Vabis AB, into the present SAAB-SCANIA AB; and (2) the reorganisation of activities on a divisional basis.

SAAB Aktiebolag worked with punched card systems during the 1950's and started to introduce the more conventional programmes now in use as from the early 1960's.

Towards the end of the 1960's the Company began to develop an integrated planning system called TIPS (Total Information and Product-control System).

To give a better idea of the Company's development level, especially with regard to personnel data, we set out two main lines below in schematic form. The distinctions between them will be largely retained in the rest of this report.

Characteristics	Existing Systems	Planned Systems
Hardware	IBM 1401-7070 SAAB D21	SAAB D22 (1972)
Time limits	Salaried-employee system: Punched-card and tape-oriented system in operation since 1966/67.	Scheduled to become operational in 1972/73
Development time	1963 - 1966/67	1967 - 1972/73
Development level	Conventional programme mainly based on payroll calculation system.	Subsystem in an integrated total system. The object is to have an on-line system with remote terminals.

2. CONCEPTS

2.1 Operational Systems

In 1962 the Swedish Engineering Employers' Association, a national organisation of manufacturers of metal products, machinery and transport equipment, presented a model for manpower accounting and statistics relating to salaried employees.

This model was mainly intended for manual processing of data and communication of mandatory information to different interested parties.

In 1963 a committee was appointed to adapt this model to automatic data processing, with added provision to be made for non-mandatory information. At the instigation of this committee a task force was constituted as of January 1, 1965, to inquire into analogous problems for manual workers. The scope of this investigation is set out schematically in Appendix 1. SAAB AB and Scaia-Vabis AB both sat on the 1963 committee and took a very active part in the development of a system for salaried employees. The results of this work were published in the autumn of 1965.

At the same time that the then SAAB AB was engaged in this central development project, parallel efforts were made to adapt this model to internal uses.

The Company's primary motive for committing itself to the development of a personnel data system was to obtain faster and more efficient bases for taking decisions on matters of personnel administration, which the use of ADP would permit to a greater extent. This automatically conferred a straight cost saving that was not specified in a financial estimate. The growing share of wages and salaries in the Company's total costs,together with the demand for rationalisation measures, made it virtually necessary to bring out better source materials for long-term personnel planning.

In addition it was essential to be able to draw comparisons, both within the Company and between different firms, which entailed developing common record definitions, classification systems and codes.

2.2 Planned System

Since 1967 work has been proceeding on the design and development of an integrated planning system (TIPS). This project is scheduled to be ready by 1973, when the Company will make a sweeping hardware change and finally convert all ADP systems into its own D22 computer.

TIPS seeks to create an integrated planning system. Naturally, this software development must be seen in the light of a general software development for the in-house machines, since the Company itself is a manufacturer of computers.

The design and extent of the personnel data system entering into TIPS have yet to be finalised, mainly because of the new factors arising from the merger mentioned previously (para 1.2). The most characteristic features of the TIPS project reflect the original intention to build up a concept-oriented rather than a problem-solving system. The project has gradually changed in character to focus more directly on problem-solving. Another basic idea is to build up a data bank to take advantage of the opportunities that the new machine opens up for this purpose. Longer-ranging plans call for the installation of terminals with direct access facilities, in other words an on-line system.

3. PRE-PLANNING

3.1 Operational Systems

No comprehensive profitability estimate in the conventional sense was made since the benefits were largely of an indirect nature, i.e. better and faster bases for decision-making in the first instance.

Most of the development work was performed by systems men and other staff experts and only to a limited extent by line representatives. No straightforward project group was appointed at SAAB-SCANIA AB from the outset; instead, these matters were handled by the Company's representatives and participants in the central development project for the engineering industry.

For the most part the personnel department acted alone in suggesting the kind of information that should be retrieved from the system. However the proposal for the system was circulated internally to the line executives so that they could submit their opinions and comments.

Provision was made for all the information to which external parties were entitled on the basis of laws, contracts and other agreements, a task that was facilitated by concurrent pursuit of the work under central auspices with a view to catering for the engineering industry as a whole. Not until the final stage, by which time everything was more or less laid down in principle, was the trade union asked to give its views on the system design.

SAAB-SCANIA AB has utilized a large part of the classification and code systems that were centrally developed with no more than minor modifications tailored to its specific needs. This was natural considering the great influence that the Company exercised on the development process. By and large the personnel data system was built up as a stand-alone system, which meant that there were no direct interfaces to other operational systems apart from those which were made to integrate the payroll calculations with cost accounting and budgeting. IBM's standard tax calculation programme is used in the system. This was the only tangible contribution made by the computer manufacturer to the system design.

The adoption of an ADP system for personnel data made it necessary to take certain positions on matters of personnel policy. This has been primarily brought to the fore by flags appearing on ADP printouts to alert for data on attendance, absence and overtime. At the same time the personnel department has been given better facilities for co-ordinating these questions.

3.2 Planned System

It is difficult to draw any definite conclusions while development work is in progress, since we do not know what the system will actually look like and even less how it is going to function in practice.

Passing judgement on the merits of a particular subsystem - in this case, personnel data - becomes even more hazardous, since the gains from a system integrated for the whole Group are hard to attribute to any one subsystem but have to be evaluated in their entirety. Experience to date suggests that originally the system was far too ambitious, which has made it necessary to carry out successive modifications.

One reason for this has been the difficulty of crystallising and putting across the underlying ideas to line representatives. This has caused delays and has pushed up costs. To aggravate matters, it has been hard to preserve project continuity over time due to the turnover of people engaged in the project. In addition, the merger between SAAB AB and Scania-Vabis AB has altered the preconditions that originally governed in 1967. This has affected the project's subsequent subject-matter, working routines and implementation.

4. IMPLEMENTATION - INSTALLATION

This section will not deal with the planned system, since this has not yet been installed.

After customary debugging and a total systems test, the personnel data system went into service immediately. It was not subjected to any pilot run on a smaller unit or any total parallel operation alongside the existing system.

Given this background, conversion to the new system turned out surprisingly well, without any major complications.

The biggest problem during a short changeover period was to obtain input data at the right time, since information about what the ADP system required in this respect had evidently been inadequate.

Events soon showed that it was highly unfortunate that more line people had not been involved in all phases of the development work. Perhaps the most telling evidence was refusal by the line executives at several points to accept the output data they received, because they felt that they were getting too much information without really knowing what purpose it would serve.

Further, a more or less persistent shortage of systems men has made it difficult to implement desired changes in competition with other high-priority data projects at the Company.

5. OPERATION

Files are now being updated by the week, partly with key punches and partly with tape punches.

The layout of new files in connection with changing over to the new system proceeded very smoothly, because existing punched card files could be directly converted into the new file layout.

Virtually no historical data were carried over into the new system.

Certainly one defect of the present system is that historical information is not being formed to a sufficient extent. However, payroll data and certain personnel data will be accumulated for at least three years, partly in order to acquire source material for revision of pay scales. By and large the system has come up to expectations, especially in regard to speedier, more accurate and more efficient payroll calculation routines.

If anything, the present personnel statistics appear to improve on their counterparts in most other engineering firms.

However, the ever more exacting demands of longer-term planning make it necessary to have more elaborate personnel statistics. Considered from this aspect, the present statistics are inadequate.

Some of the line executives seem to feel more dubious about the statistics they are getting today, an attitude that may be largely attributed to their belief that they are being given too much information for which they have no use.

In several respects the system has proved too rigid to satisfy the demands of flexibility required of an ADP system. This rigidity has emerged in the following cases:

1. The present programme produces a fixed set of output data (standard output) at a fixed time. Special runs must often be done manually in between, since, owing to the shortage of systems men (to mention just one factor), it is impossible to obtain sufficient ad hoc programmes for special runs, and there is no rapid-retrieval system such as Informatics in use.

2. Many observers believe that the output data are hopelessly out of date by the time they are delivered, which limits their usefulness, in such areas as absence control etc.

3. Reorganisations and other internal changes have rendered it difficult to make computer follow-ups.

The system in force up to now has been mainly used at the head office and its personnel department. In principle, other units have had decentralised personnel functions with their own manual or automatic systems.

The Company's accounting routine is integrated with the personnel data system by means of a magnetic tape containing financial data concerning employees which can be directly used as input in the accounting routine.

Certain minor interfaces are also provided with the production routines in the manual worker sector.

6. INTERNAL INFLUENCE

Thanks to SAAB-SCANIA's membership of the committee which modelled an ADP system for the engineering industry, all necessary hook-ups for reporting to administrative agencies, employer associations etc. were provided for, since that was one of the aims of the committee's work.

This has also meant that SAAB-SCANIA AB, as mentioned earlier, has largely adapted itself to the devised classification and code systems. Although these centrally adopted codes have sometimes been much too general to permit a 100-percent fit into the Company's circumstances, they have proved helpful. The alternative for SAAB-SCANIA, of course, would have been to develop new code structures entirely on its own.

Efforts have been made wherever possible to incorporate the demands that collective bargaining imposes on a pay-oriented system into the system design, which caters for statistical requirements at both central and local levels.

A revealing commentary on how well this system is working is that a part of the Company's wage and salary statistics is also distributed to personnel organisations which do not have the same resources for producing such statistics.

7. FORWARD PLANNING

The main elements of future development in which the Company is now engaged have already been presented (under sections 1,2,3.3 and 3.2). Put briefly, this commitment aims at a higher degree of integration both for the Group as a whole and within each of its affiliated firms, where the requirements of increased flexibility is perhaps the main spur to the ongoing development of a new information system, which is expected to become operational in 1972/73.

It is hard to predice how the function or status of the personnel department will change in the future and to what extent this will depend on advances in computer technology.

It is safe to assume that the ever growing demands that will be made - and in part are already being made - of a more co-ordinated personnel function across divisional boundaries can scarecely be met satisfactorily until the planned system has been installed.

SAAB-SCANIA AB is in favour of co-operation with administrative agencies, organisations and other firms, in order to develop classification and code systems through joint effort.

But in other sectors firms will have greater inducements to exchange information and experience than in the past.

AUTOMATIC PROCESSING OF PERSONNEL DATA

A. Different components of the model system

SCHEMATIC OVERVIEW

VARIOUS SOURCE MATERIALS

Hiring information
Income-tax demand notes
Change of particulars forms
Job tickets
Attendance cards
Travel reports
Additions and deductions cards
Rate-setting information

PROGRAMS (with CONSTANTS, COMPARANDS and STANDARDS)

INPUT DATA
ADP
OUTPUT DATA

FILES (containing basic data) and CUMULATIVE DATA

Personnel records
Entries in personnel records
Personnel lists

Payroll calculations and reports
Pay specifications
Pay reports
Tax reports
Deduction reports
Employer statements

Rate-setting and pay statistics
Rate-setting sources
Internal pay statistics
External pay statistics

Personnel budget follow-up
Sources for follow-up of personnel budget

Personnel statistics
Internal personnel statistics
External personnel statistics

Other reports of
Internal reports
External reports

B. Classification and code systems were largely produced coextensively with development of the above model system.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Credit Lyonnais

CASE STUDY NO. 5

Paris, November 1971

The Swedish Council for Personnel Administration -
District of Stockholm

Miss Agneta Bruewitz

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I. Introduction

II. Concept

III. Pre-Planning

IV. Installation

V. Operation

VI. External Influence

VII. Forward Planning

I. INTRODUCTION

The Bank

Credit Lyonnais is one of the largest banks in France. Its head office is located in Paris. The bank has approximately 2,000 offices - 5 region, 75 branch and 1,800 local offices. In addition, there are 200 foreign offices.

Personnel

The number of employees is approximately 38,000 (September 1971). All but 1,000 of these are office workers.

Organisation

Administrative management
10,000 employees, in 6 "boards"
7,500 in Paris;
2,500 employees in the rest of France

Functional management
2,000 employees; the largest department is Personnel with approx. 900 employees

International Business and Financial Management with 1000 employees

Bank Offices
25,000 employees

(5 regions, each with approx.5,000 employees)
1. Paris - the city
2. Paris - the region
3. West and Southwest France
4. Northeast France
5. Southeast France

Personnel Administration

The central Personnel Department is located in Paris. Organisationally it is a sub-department of the Administrative Department and the Personnel Director is thus subordinate to the Administrative Director.

PERSONNEL DIRECTOR

A Training

B Labour relations; labour legislation

C Personnel planning and development

D Project management and methods

E Recruitment and guidance

F Administration

The units employ the following number of people:

A	180	persons
B	40	"
C	90	"
D	40	"
E	60	"
F	360	"

This organisation developed as a result of structural changes within the bank that led to centralisation of all activities from 1968. Earlier each branch office was in charge of its own personnel administration and functioned rather independently of the head office in Paris. The central Personnel Department was much smaller at that time than today.

Each branch office employs 2 to 10 persons who handle personnel administration. About 200 people work in personnel administration at this level. In addition there are personnel secretariats of from one to several persons connected to the administrative "boards" at the head office. About 100 persons work in these functions. The total number of persons in the bank working with personnel questions is thus 1,200 although some of these work part time, with other types of questions.

Computer equipment

According to the Personnel Director the bank is probably IBM's largest customer in Europe. The bank uses IBM's total line of products. Four hundred and forty persons are employed at the bank's computer department. All bank work is computerised, thus making the computer equipment rather different from that of an "ordinary" company. The Personnel Department makes use of only a fraction of the computer department's time and equipment (A complete description of the bank's computer equipment is unfortunately not included in this case material).

The bank has four computer centres, one at each of the four regional administrative units in Roubaix, Melun, Tours and Valence. These computer centres handle all the bank work in the region. The equipment is French and tailormade for the bank.

In addition Paris (the city) has two computer centres (Ménars and Levallois) equipped with 7 computers:

One GE 600
two IBM 360-25
two IBM 360-30
two IBM 360-65

The 360-65's are to be replaced by 360-75's.

There are plans for further centralisation of the computer work done outside Paris at three centres in Rillieux (near Lyon), Tours and Limeil-Brevannes (outside Paris); these centres will be interconnected to one another and also to accounting centres equipped with large-scale terminals GE115 which will be located near the bank offices.

The four regions outside of Paris (city) already have two off-line computers; Lyon has an IBM 1401.

II. CONCEPT

Region Paris (the city) already had an IBM 1401 in 1964 for registering personnel data and computing wages. Other regions handled their personnel administrative routines manually.

In 1968 a reorganisation of the whole bank was initiated that aimed at stronger centralisation and increased efficiency. Centralisation of the bank's personnel administration was also started at that time. An accelerating factor in this centralisation was a law enacted in 1967 that allowed all persons employed for a certain time to receive a certain share of a company's profits. In order to calculate this share the bank needed a great many data about its personnel, systematically registered. Before starting to devise a register of personnel it was clear that the register would be used as a basis for developing personnel policies of various types and for centrally calculating wages.

Objective

The objective was a totally integrated personnel information-system for the whole bank, not, however, a system integrated with the bank's other activities and systems.

The objective of the reorganisation of the bank's personnel administration may be presented in the following steps, as planned in 1968:

Step 1 had as its objective to develop a central register for all employees in the bank.

Step 2, begun in May 1970, involved standardising all personnel information from the various units in the bank. The goal was to produce identical personnel data throughout the bank, thus creating a basis for a common personnel policy, and extend the parameters so as to be capable of dealing with the payroll.

Step 3, which is about to start, involves and has as its goal centralisation of all personnel data in the bank. This includes standardising and centralising the complicated wage system that applies to the bank.

After these steps are completed certain routines, for example the calculation of pension "eligibility", remain to be installed, since the Personnel Department is striving towards making use of computer systems in all personnel data and routines. Because of the great amount of information recorded on each employee this goal is still relatively distant.

With the central Personnel Department's access to all current and historical data on every employee as a basis, long-range personnel planning can gradually be carried out in the future. The unit within the central Personnel Department in Paris that works on projects and methods is already developing models for short-range and long-range personnel planning. Those models have partly been taken over from sources outside the bank and partly been developed within the bank. The personnel planning now in use is prepared manually from the personnel register.

A detailed pilot model has already been worked out for a small part of the personnel.

III. PRE-PLANNING

Before the project was started a small project group was formed that was to do the practical work on the system based on the directives that the Personnel Director and Credit Lyonnais had given. The group was made up of the Personnel Director, one of his associates and three consultants from an external bureau of organisation consultants. Because the bank establishes computer installations according to the needs of banking activities and not according to the needs of the bank's personnel administration, the group's work and planning was concentrated mainly on the system and its practicability; it was not so concerned with calculating costs since the computer already existed and had spare capacity.

The planning was carried out by the Personnel Department alone under the supervision of the Administrative Department. The group could work relatively independently and therefore quickly and efficiently. The design of the system itself was worked out by the project group together with personnel from the EDP-department. The project group prepared outlines and directives for the system personnel who then worked out the details. (It is not clear why the latter were not more closely involved in the overall planning).

Because the personnel information system made use of specially developed codes and systems it was judged necessary for the bank itself to design these. Furthermore, the bank preferred to construct its own system rather than to take over a system from other enterprises. As a consequence of this employees of IBM took no part whatever in the design of the system. The Systems Department of Credit Lyonnais very seldom applies programs from computer manufacturers, preferring to design their own programs and systems.

Much importance was placed during the planning stage on attempting to develop uniform rules for the collection of all data. Since the personnel administration of the bank had been decentralised there was a great diversity of personnel data, particularly pertaining to the calculation of various benefits. The objective was a centrally directed personnel administration and, accordingly, a uniform personnel policy for the entire bank.

What was primarily changed was the organisation and the routines. Earlier there had been small groups of one or more individuals in each organisational unit that were responsible solely for one personnel administrative activity, for example checking absenteeism. Thus each unit had a number of different groups working on personnel administration. All of these groups were informed as soon as a change occurred in each other's data. In other words, each group was thoroughly occupied with exchanging information and found it very difficult to gain an overall view over the large number of personnel it had in its register. The system was unwieldly and impractical.

The handling of data was changed together with the reorganisation. Each small personnel administrative group was to be made up of five persons, and was to handle all information about approximately 1,000 people among their general personnel duties. Thus each group could quickly get a grasp over its own field of work and handle its activities in a rational manner.

The new system with update and report forms that were to be kept up to date and sent in regularly was introduced to these new groups. They also had to learn all the new codes that had been developed. For this purpose they were supplied with a convenient code table that could be used for all the data. The new system was introduced to these groups with very little difficulty.

It has however since become apparent that the members of the groups feel themselves somewhat neglected because their jobs in a sense have been made easier and less responsible and interesting, and because it is more difficult to read the personnel files that they work with. This is the only noteworthy problem that has arisen with the altered system.

There were no requirements to adapt the collection of data to external authorities or to any other part of the bank's organisation. The planning was carried out by the central Personnel Department alone and by the designated project-group. Both the board of management and the personnel organisations were informed of the project's progress but did not take part in the planning.

IV. INSTALLATION

The system has been developed and implemented step by step. Continuous development and improvement is taking place under the supervision of the project group.

No pilot run was undertaken in 1968 during the first stage because experience could be drawn from the well-developed system in use in the Paris region since 1964. When deciding upon reporting cycles it was a question of balancing between the principle of keeping data as up-to-date as possible and limiting the number of times the computers were used since banking activities had priority. The result was that the personnel registers are updated 4 times a month and the wage registers once a month. No external conditions influenced these reporting intervals.

The main problem in connection with the installation was that of delays in the EDP-department since the demands of the Personnel Department were considered less pressing than the demands of the bank's customers.

Certain delays in reporting of data occurred. The units that were used to reporting in connection with IBM 1401 had more difficulty in adapting to new routines than those that were used to manual routines.

Another problem experienced in the beginning was the handling of all the existing and required tabulations, reports and print-outs. Some of these could not be checked at all and had to wait for months till further data could verify them. This is probably a direct consequence of the step-by-step development of the project.

IBM 1401 and IBM 360-65 were run in parallel for a few months in order that the project group could make sure that the systems corresponded.

V OPERATION

Concerning the transcription of personnel data to tapes, each employee already had a file with all the information. Consequently, the information only had to be coded and transferred to the magnetic tapes. The personnel that were to handle this existed already and needed only a short training period in order to function properly. When a change is made in a basic piece of information it takes about 10 days for this to be changed in the central personnel register. No very difficult problems exist in producing the various output data on time except that previously mentioned difficulty that all other banking activities are given priority.

Input in the registers comes from the various units in the form of basic data on the individual, reported changes, information about new employees, and information for wage calculations.

In addition there are certain performance appraisals which up to now are highly confidential and which thus require special arrangements.

All output from the computer passes through the central Personnel Department. Information about the personnel is returned periodically to the basic units partly in the form of documents on individuals, partly in the form of lists of the personnel in each unit. A duplicate of all this information is also kept by the central Personnel Department. Information going to the board of management and to units outside the bank are revised and prepared for each special purpose by the central Personnel Department. About 25 different standard outputs are available at each updating occasion, but they are produced only once a month. These go to the Central Personnel Department where they are used as a basis for different projects and thus also as a basis for central decisions concerning the bank's personnel administration.

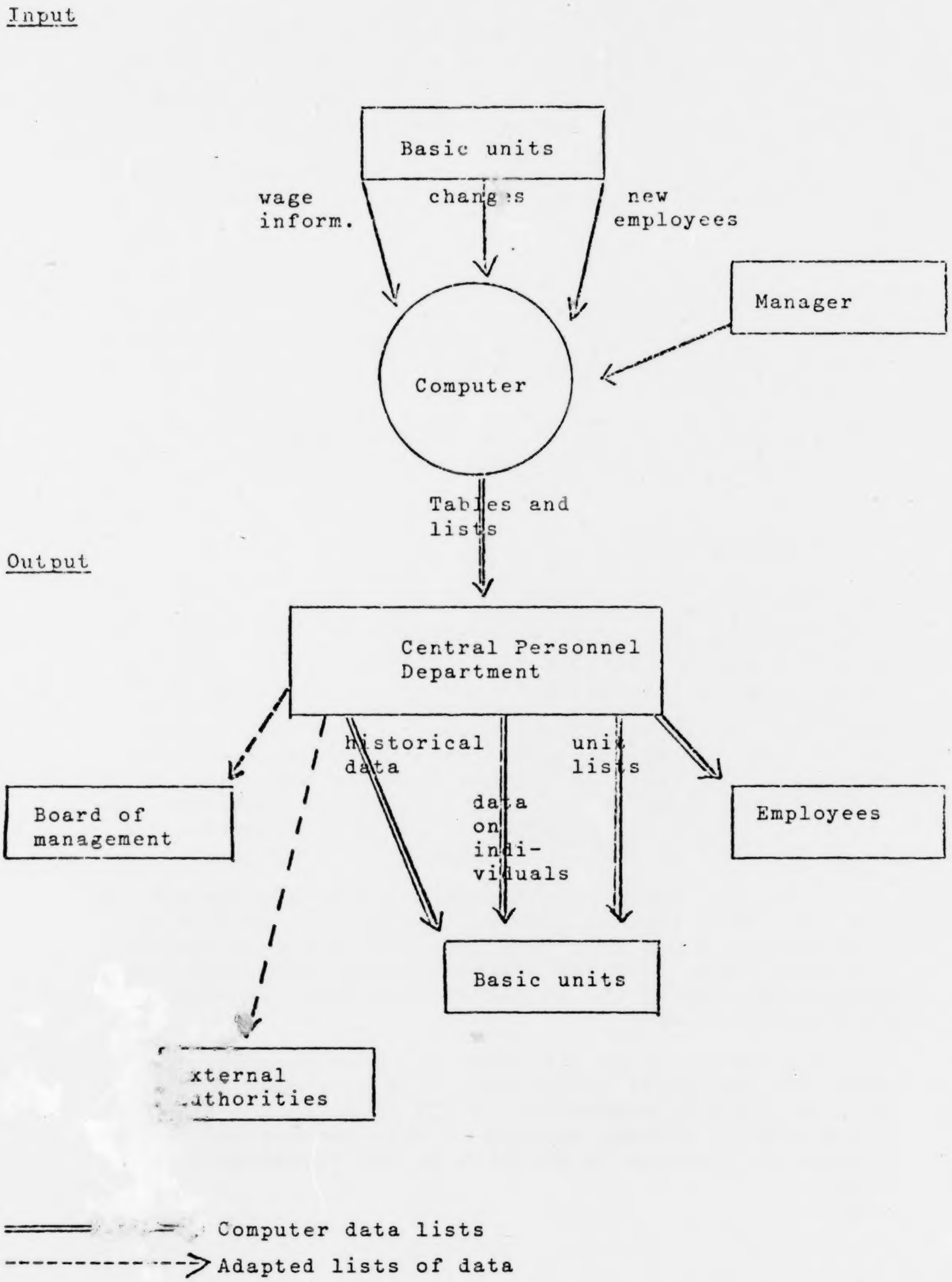
The updating of wage calculation for Head Office goes via the Personnel Department to each employee in the form of a computer-generated notification of earnings etc. forming a rather complex payslip calculation. This system will apply to the whole bank by the end of 1972. Tables of historical data are made four times a year and are distributed to the various units, duplicates being kept centrally in Paris.

The problem of confidentiality of data is not a great one compared with experiences in Sweden. Certain information is not contained in the computer data lists and is not passed on to the employees. This includes partly certain performance appraisals and partly assessment of which other tasks an individual is able to undertake during the next year. This latter is not a long-term promotion system but rather a form of preparedness for the coming year. This information is handled centrally by the Planning and Development Department and remains in their hands.

Data from the time before the central personnel information system was installed, that is, before 1968, no longer exists. All information about the individual employee is saved for two years from the date he or she leaves the bank. Information on women who leave the bank because of pregnancy is saved for five years.

Certain small adjustments have been made in the system and are still made from time to time but by and large the system is flexible and functions according to plan. The personnel EDP-system has not in itself led to any structural changes in the bank's personnel administration, or to a change in its position in the bank's organisation. The board of management has access to the information but for them it is always normally edited and specially compiled. The same applies to information distributed upon inquiry to organisations, authorities, etc. Integration of the personnel information system with other systems within the bank occurs only concerning the employees' own financial and pay transactions with the bank. Otherwise the personnel administrative system is entirely separate from the other EDP-systems.

The new system has led to stronger centralisation of the bank's personnel administration.


Input
Basic units
wage inform.
changes
new employees
Manager
Computer
Tables and lists
Output
Central Personnel Department
historical data
data on individuals
unit lists
Board of management
Employees
Basic units
External authorities
Computer data lists
Adapted lists of data

VI. EXTERNAL INFLUENCE

Exchanges of information occurs between the bank and tax, insurance and pension authorities. That is to say, the bank gives information to these institutions, but has in no way adapted its system to any special demands made by them. The same principles apply as were mentioned earlier, i.e. no data is passed on in its original form without being adapted to the purpose in question. Before 1968 information was also given to these institutions and was then handled manually.

The system is designed so that special information about individual employees can be extracted when needed.

A special controlling factor for all the data in the bank is l Association Professionelle des Banques, which has a considerable influence on the bank's routines and whose agreed rules and methodology must be conformed to when calculating wages, pension "eligibility" etc, in all state banks.

The government has an indirect influence through this association, but otherwise no influencing external factors exists.

VII FORWARD PLANNING

The bank has no plans to expand their collaboration with any external organisation in the future as regards system design and coding structures. One is of the opinion that the bank has every possibility of adapting and developing the system further internally, and that no external institution can be compared to the bank and therefore contribute advantageously. The same applies to the computer manufacturers and the assistance they can give. The point of view is that the bank wants to develop everything internally. A change in this attitude is hardly likely at the present. The bank's intention is to continue to develop the system by stages.

When all information has been completely recorded in the computer system an attempt will be made to develop a short-term and a long-term personnel planning system that will facilitate the work of the Personnel Department, especially that of the so-called Personnel Planning and Development Group.

The intention is also that the bank gradually will store all personnel information in a data bank which will be directly accessible to all units in the field. The system is already adapted to this purpose and the routine is expected to function in the foreseeable future.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Philips Industrie Ges. M.b.H.

CASE STUDY NO. 6

Stockholm, December 1970

The Swedish Council for Personnel Administration,
District of Stockholm

Bengt Linder

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I. Introduction

The firm

II. Concept

III. Pre-Planning

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I. INTRODUCTION

The firm

The Austrian Philips Group consists of six companies with a national headquarters in Vienna, forming one economic unit. For 90% of their total production, these factories are supply centres for the whole Philips Concern, especially for tape recorders, cassette recorders, video recorders, dictation machines, television, certain electronic components, ladies' shavers and special lamps.

At present Philips employs around 9,000 people in Austria, of which 3,000 are staff employees and 6,000 manual employees. More than half of the employees are women.

The turnover of the Austrian Philips Group on domestic and export markets will amount to U.S. $150 millions in 1970. Exports account for roughly 3% of total Austrian exports and 33% of the exports of the Austrian electrical industry. Philips Austria is the largest privately owned electrical company in the country. In terms of sales, it holds the 6th place in Austrian industrial enterprises.

The personnel administration within Philips Austria is organised in the following way.

In each of the six factories there is a personnel department which carries out ordinary personnel administration duties except wages and salaries. The latter are administered in the finance or administrative departments. At the head office there is also a central personnel department where co-ordination of personnel policy is carried out.

Routine personnel data is run on a hired IBM 360/50. System development and maintenance are performed by a special system development group, the "ISA-group" within the administrative department.

At present a personnel data system is in operation comprising wages and salaries administration and thus contains basic personnel data as well.

II. CONCEPT

At the beginning of the sixties wages were calculated by punching machines, while salaries were administered wholly manually.

The reasons in favour of a transition to EDP were primarily the following:

- data volumes had increased heavily because of the expansion of the company;

- EDP would provide the possibility of getting faster data handling and better uniformity in calculating wages within the Philips Group and at the same time better and more accurate statistics for salary administration etc.

- difficulties had been encountered in employing and keeping personnel in the salary departments.

Salaries and wages were both ready for transition to EDP and at this stage a step-by-step development was anticipated, with the possibility of subsequent extensions to other personnel administrative functions. It should be added here that Philips was one of the first industrial companies in Austria to make use of EDP in personnel administration. Thus at that time there hardly existed any experience in the country of system development or operation for manpower purposes.

No negative attitudes from the managers of the company were expected - or encountered. The board of management made the decision and gave their active support all the time. At the same tine an administrative development and general modernisation process was undertaken, making the managers familiar with, as well as interested in, administrative changes.

No large-scale changes in the organisation were considered necessary as a condition for the transition to EDP operation. Personnel administration in the six companies had already been organised in a fairly uniform way. On the other hand,it was expected that there would probably be rather extensive administrative changes, primarily concerning procedures within the different salary departments, since partly disparate systems existed in the different units.

The decision to start the application of EDP procedures for calculating salaries was made in June 1967, by which time a brief project plan had been drawn up. This estimated that there would be a saving of 4 posts, and it indicated that there were possibilities of developing the wages system parallel with the planned salary project. It would be correct however, to say that the decision was based more upon value judgements concerning effectiveness and flexibility, rather than upon economic savings.

III. PRE-PLANNING

After the decision by the board of management the work on the project was started. The personnel manager had overall responsibility while the main detail work was performed by a project administrator from the "ISA-group". An advisory group was set up, consisting of representatives from the personnel, wages and salary departments at the sales and manufacturing companies in Vienna, along with representatives from accounting departments. This project group met 3 - 4 times whilst work in the interim was performed by the systems engineer. In this way the project group was able to make successive decisions about the design and the priority of the project. As to the priority on the output-side the main determinants were "To provide fast and reliable information for the individual employee(gross and net calculation) in order to prepare the net lists for the banks in time so that the staff is able to dispose of the monthly paid amount; to have a detailed expenditure list for our own accounting departments; and furthermore forms serving as a good base for correct payment of taxes and social security contributions." It was also necessary to be able to supply information to other external authorities, both federally and in the nine Provinces.

The geographical distribution of the Philips Group all over Austria caused problems that had to be taken into consideration during the planning work. Thus, for instance, the postal service between Klagenfurt and Vienna was considered too slow. The problem was solved, however, in such a way that the staff employees in Klagenfurt could be catered for by a computer in Vienna, while the wages of the manual employees had to be run on a computer in Graz in order to meet the time limits.

The project group quickly reached unanimity concerning input-output requirements. However, practical procedures occasioned more thorough discussions.

As mentioned before, the different wage and salary departments had partly developed their own procedures, and the need to adopt standard procedures for EDP operation thus brought about more or less significant changes of customary routine and working habits.

Representatives from the employees did not participate in the project group. They were, however, informed of results.

Since Philips was one of the first companies to make use of EDP in personnel administration, the classification and coding problems became very great. As an example may be mentioned that out of more than 250 data fields which are embodied as fixed and variable data in the system, it was only possible to use 4 codes from external sources (coding of nationality, religion and profession plus banks).

When it came to integration of input-output with other main functions within the company, an adaptation was made to meet the demands from finance and accounting functions.

The project work was performed wholly by the firm's own personnel. The computer manufacturer did not take any part, but a small sub-routine is being used, however, concerning taxes from the computer manufacturer's software arsenal.

Apart from external consumers within Austria, Philips had also to report a good deal to the parent company in the Netherlands. The particulars given there, though, have not affected the system design to any great extent.

Despite the independence accorded to the different companies within the international Philips Group on questions of wages and salaries, it is quite natural that the need for uniformity within the EDP-system has turned out to affect questions of personnel policy as well:

- the claims of the system on absolute deadlines do not make it possible for wage and salary changes during a month always to be displayed in the next following payment of wages and salaries;
- premiums, bonuses, benefits, etc. have been standardised.

When the system development was completed towards the end of 1968, the results were presented to the board of management once more, and they decided upon inplementation on 1st January 1969. After this the system was introduced and its procedures explained, etc., at special training conferences for all personnel involved.

IV. IMPLEMENTATION - INSTALLATION

During the project planning, the intention had been to undertake a pilot run parallel to the old system. At first it was calculated that a trial run of 3 months would be needed; afterwards this was reduced to 2 months, then one month, and finally, the total payroll procedure for staff employees was transferred to EDP on 1st January, 1969, without parallel running.

The problems arising at the implementation stage may be summoned up as follows :

- some insignificant programming errors;
- some lack of accuracy of data. Above all, difficulties at central level of checking output versus input, since errors in the transfer of primary data, e.g. time cards to input in a coded form, cannot be checked centrally. The errors which can be identified are believed to have been caused partly by inaccurate information and training, partly by lack of insight as to how errors can be "magnified" and accumulated in the system. Consequently, more time for information and training of all personnel involved would have been desirable.

It deserves to be mentioned that, on the whole, the transition was executed completely without unpleasant consequences for the employees themselves. They all got their correct payment in due time.

Nor has later experience shown the need for any significant revisions of the system. Continuous housekeeping has been necessary, of course, but the system has been maintained with its fundamental features.

V. OPERATION

The current system is not of an on-line kind. Development into a higher technical system of that kind is looked upon as desirable but not essential until other information processing requirements have proved a need for a more modern computer of greater capacity.

During the transcription of relevant personnel data, the greatest problem was that of confidential treatment. To ensure complete confidentiality a special coding system has been developed, based upon personal identification numbers. This means, for instance when handling new employments, routine personal data is recorded on a form which is sent for punching. After a few days confidential data concerning salaries and wages and benefit ssrvices, which cannot be related directly to the former personal data, are sent.

Data from the old manual system are generally not stored in the data system. Certain historical data are prescribed by law and decrees, and data of that kind that have to be retained are being stored outside the system. Since start-up, certain data are stored, however. After the system had been in operation for some months, it was possible to make an initial evaluation. This showed that the original goals had been attained, e.g. faster handling of data, more data available, better evaluation of data and greater uniformity in calculations concerning the payment system. For future development it is planned to extend the system to handle personnel statistics and information in order to get a better basis for e.g. manpower planning. It is also asserted from the line management side that the system has achieved the aims and purposes intended. Above all it provides correct calculation of payment but also provides possibilities periodically to analyye costs and payments against budget. For the latter purpose special statistical requirements have been established by line management. Procedures for follow-up results have been simplified and completed. There are complaints though, about the time required to analyse directly from the data files.

The only change in reporting relationships so far noticeable is that the line management orders statistical information. It should be pointed out, however, that the contacts between the head office and the different companies were fairly intensive even before.

As to centralisation or decentralisation of personnel functions within the company, no formal change has been made. It is true that the administration of payroll procedures has been centralised, and along with this decisions concerning how procedures are supposed to work, but this has not caused any changes in decision making and policy making at different levels. It is anticipated, however, that the role of the central personnel function is liable to be altered as a consequence of extended use of EDP. What has happened to wages and salaries so far is that part of the personnel administration work is now performed in a uniform way throughout the whole Philips Group, and that communication and information regarding payroll questions have been considerably facilitated between the head office and the units, as well as between units. The prospects of increased co-ordination via the head office are thereby obvious.

Within the central payment function at the head office some changes have come about however, as a consequence of the EDP transition. The work is now - contrary to a former rather well balanced apportionment over the month - heavily concentrated at the middle of the month. To the employees this means that one has to resort to overtime work in the middle of the month and that compensatory leave of absence can be had around the end of the month.

Furthermore, the employees seem to regard their work as more tedious, more monotonous and less responsible.

Concerning reduction of personnel as a consequence of EDP, it was estimated there would be a saving of 4 persons in the first calculation. Up to the autumn of 1971 a reduction of 1½ persons had been made and a further reduction of 1½ is expected.

VI. EXTERNAL INFLUENCE

The demands from external consumers were included in the system analysis and the operational system thus gives the output needed. Information is handed over to external consumers by the head office as well as by the local units. Mostly, however, a manual handling of the computer output is necessary, in order to make an adaptation to the consumers forms, tables, etc., possible. In one case only, which is with respect to tax authorities and social insurance institutions, it is possible to communicate directly by punched cards.

As stated before, there hardly existed any developed general codes at the time of starting the project. A great part of the work has, therefore, been concerned with the developing of codes and classification systems. To try and reach compatible systems via Employers' Confederations, government authorities etc., was looked upon as wholly impossible because of the complexity of the task. Besides, a single company was not considered to be adequate to initiate and carry out the necessary investigation. As far as Philips is concerned they preferred therefore, especially in Employers' Confederations, to act by example with the purpose of stimulating the initiation of a project for national development of codes and classification systems. The aims would be to facilitate compatibility between companies and society.

As a pioneering company in Austria Philips has been able to profit by a flexible, well functioning administrative system within the group along with considerable EDP experiences, although, for the time being, it suffers from incapacity regarding the use of EDP techniques for flexible exchange of information with other companies or with society.

In other words, the main problem is that of compatibility. It is, of course, of great interest to Philips continuously to keep an eye on all attempts regarding co-ordination of classification questions, in order on one hand to put forward some of its own experience and to act so as to prevent a total revision of their own system on the other.

Apart from the need to attain compatibility, it is also necessary to make a more complete analysis of society's demands for information from companies. Today certain information is given which is regarded as being of doubtful or unknown value to external consumers. One example is the statistics periodically sent to the Employers' Confederation. It is based upon a job classification system which is considered to be so imprecise as to render the finished statistics inappropriate, e.g. for correct comparisons between companies.

In this connection, finally, the effect of the data system on collective labour agreements should be commented upon. After the first negotiations following the introduction of the system, the project administrator took part as a special observer with the specific mission of keeping an eye on the very special aspects of EDP. Besides, the members of the works council units are now familiar with the prospects and limitations of the EDP-system, so they aim at negotiation settlements able to fit the system.

VII. FORWARD PLANNING

With the prospects of the continuing development of the EDP-system for personnel administration the predominant question is that of compatibility with other systems.

Thus, Philips now has an internal system offering fast communication and interchange of information within the group, while on the other hand, the conditions for external communication are strictly limited.

At this stage priority is given to the development of external compatibility in preference to developing the contents of the current system.

In order to bring this about, Philips declares its strong wish for the constitution of a national committee, consisting of representatives from e.g. companies, educational institutions, government agencies, employers' organisations and employees' organisations. The task of this committee would be, in the first place, to establish uniform coding structures.

Another question of interest in this connection might also be that of the future role of personnel management. Within the company two reasons seem to indicate an upgrading of its importance.

There is the development of labour markets in the first place. For many years a period of labour scarcity has prevailed, of such an obvious character that labour supply is one of the main determinants of production and development of the company. Secondly, there are changes in the claims by employees on the company. From being interested in material reward only (wages and salary) they now claim their right to have work of real meaning, along with the feeling of well-being, security and prospects of developing themselves. Both these circumstances increase the importance of the role of personnel administration. For these reasons it is also natural that the functions of personnel administration make more and more extensive use of EDP.

It is not a question of believing that the use of EDP would cause an upgrading of the functions of personnel administration, but rather that due to the very fact that the questions of personnel administration increase in importance, EDP will be used more widely in the future.

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Esso Petroleum Company (U.K.) Limited

CASE STUDY NO. 7

London, October 1971

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I. BACKGROUND

The Esso Group in the U.K. and Eire consists of Esso Petroleum Company Limited and a number of subsidiary companies. There is a large tanker fleet, two refineries, a distribution network of major terminals, bulk plants, service stations (both Company and tenant operated), pipelines, etc. (some distribution is handled on behalf of the Company by authorised distributors), a research laboratory providing a service both to Esso Petroleum and to other Standard Oil New Jersey affiliates world-wide, a central-heating installation subsidiary, a main marketing subsidiary in Eire and various smaller marketing-type subsidiaries and associated companies in the U.K. The U.K. Group does not itself own or operate any oil or gas fields.

Total first-cost investment for the U.K. Group amounts to over £400 million with a turnover of around £600 million. The total manpower of approximately 11,500 in 1970 represents about one-quarter of all Esso (Standard Oil New Jersey) manpower in Europe. It is made up (to the nearest 5%) as shown in Figure 1. These are 1970 figures.

The oil industry is of course capital intensive and for many years Esso management has followed a manpower philosphy of "high quality - low quantity". The Company has a national reputation in the field of personnel management and good employee relations combined with consistent productivity growth, good pay and conditions, and low unit labour costs. Thus in the last decade the Company's investment and sales volume have more or less doubled while manpower has declined by about a third in spite of entry into new more labour-intensive activities. This general approach over at least the past 20 years has resulted in unremitting attention at all management levels to manpower efficiency and a considerable sophistication among managers concerning manpower budgeting and accounting and utilisation.

This concentration on manpower as a key business factor representing a substantial proportion of operating costs (and one of the rather few costs over which management can exercise tight and rapid control in this industry) is common throughout Standard Oil New Jersey organisation world-wide. A further background point is that in 1966/67 Esso Europe Inc. was set up in London to provide a co-ordinating and advisory service to the 14 Esso main affiliates in Europe and their subsidiary organisations. This has strengthened further the preoccupation of Esso management with manpower aspects in business.

II. THE PIONEERING STAGE 1963/67

The development of manpower planning in Esso in the U.K. and indeed in Standard Oil generally owes much to work done in the refining function world-wide during the 1950's and 60's to make radical improvements in refining productivity following an over-manning situation in many

FIGURE I

MANPOWER DISTRIBUTION IN 1970

Function	Grade			Approx. Total
	EMPT (1)	Support (2)	Manual	
Marketing (incl. road tpt. and storage)	25%	15%	60%	100% - 6,000
Refining	20%	10%	70%	100% - 2,000
Rail,pipe and sea tpt.	50%	negl.	50%	100% - 1,800
Research	40%	35%	25%	100% - 500
Corporate	45%	55%	negl.	100% - 1,200
TOTALS (4)	3,500 (3)	2,000	6,000	
	or 30% total	or 15% total	or 55% total	- 11,500

Notes:

1. Executive, managerial, professional and technical
2. Clerical and technician grades
3. of which, excluding Fleet personnel, some 45% have professional or academic qualifications beyond "A" level (high school)
4. immediate supervisors are counted within grades supervised.

refineries at the end of the Second World War and a great increase in the capital requirements and operating costs of refining processes. This gave impetus to the development of manpower budgeting and planning systems, of methods of measuring productivity in refineries and of developing classifications for different kinds of refining manpower in order to measure and control the occupational mix. Further development lay in the correlation of manpower stocks with investment, throughput, refining complexity and other variables in order to determine operating parameters and control ratios, and thus to establish manning standards and reliable comparisons for different kinds of refineries around the world. Such techniques, crude at first, have become increasingly sophisticated, accurate and useful and have certainly paid off handsomely. Initial hostility and disbelief has long given way to welcome on the part of refinery managements, who have come increasingly to accept them as normal managerial practice and to rely upon them for guidance in setting targets, economic estimating and measuring comparative progress. They have provided an example and foundation for manpower planning work in other functions, now being developed within European affiliates in particular and linking more closely than in many industries manpower planning with operating and economic factors and with corporate planning as a whole.

The U.K. Group's Fawley Refinery came on stream in 1951 and from a peak of just under 4,000 in 1950's now has a strength of about 1,800. It is one of the major Jersey refineries. Its management has grown up with this approach to manpower and indeed has contributed in no small way to the development of these techniques. It was no accident that Fawley pioneered productivity bargaining through the Blue Book approach of careful productivity measurement and was among the early British organisations to have a formal manpower planning unit (1957). This reported independently to the Refinery Manager and also had responsibility for promoting and co-ordinating general efficiency and cost reduction measures.

Such managerial techniques make heavy demands for data and data-manipulation on accounting and personnel departments. Fawley was the first part of the Esso U.K. organisation to acquire a computer, and by the beginning of the 1960's had computerised its payroll and was developing a pilot personnel system. Head Office had subsequently acquired a separate computer at that time almost certainly the largest in commercial application in the U.K. and also introduced a computerised payroll system of its own which eventually extended to cover nearly all U.K. personnel including those in Refining. This gave the foundation for a computerised personnel data system, the planning for which began in 1960.

An early application of the computer at head office to personnel work was instigated by the Salaries Division of Central Employee Relations Department. Esso's Salary Division have for some years provided the common secretariat and services for a group of 14 individual independent "blue chip" companies who maintain for mutual benefit a highly sophisticated salary survey system between themselves. This is on the basis of comparative salary levels by discipline, surveyed annually, and a more complex and detailed trienniel survey by benchmark jobs. The total population of the participating organisations is by now some 380,000 monthly-paid staff, with 2,400 individual salaries and 50 benchmark jobs involved, the data bank extending over a 15 year period. Complex distribution matrices and curves, etc., are required as output and by the beginning of the 1960's the workload involved for Esso in co-ordination, calculation and publishing had become onerous. A first attempt was made in 1962 to programme some of this work but the "grassroots" design could not be made to work satisfactorily and it was obvious that a very demanding design and programming task was involved. During 1963/64 however a successful programme was written for each type of survey based on similar applications by Esso in Germany and Belgium and some work done in a related field by Shell. These basic programmes have gradually been refined and developed and are now highly successful.

Meanwhile Michael Hall (subsequently Director of the Industrial Manpower Project at the London School of Economics) was at this time Head of Recruitment at Head Office. He had developed an interest in the need for better manpower classification and planning both nationally, and within Esso to develop the work being done in the refining function. Eventually management agreement was obtained to a Head Office computerised records system, to be extended to cover the Group. A manpower planning analyst was added to the Recruitment Division, and work began.

It was soon discovered that computer manufacturers at that time at least had little of practical value to offer in designing a system that suited Esso requirements, nor did there appear to be any relevant experience to draw upon within Standard Oil New Jersey. The system was designed and built from the grassroots by personnel men who knew little of computing and computer men who knew little of the personnel function or manpower planning, although the experience gathered in setting up payroll systems certainly was valuable. The Computer Group was becoming more heavily committed in all directions at this time, and the design and programming of this first system was in the end a long drawn out affair over several years, with design modifications and changes in personnel and shifting priorities causing discontinuities. Nevertheless, the central computerised personnel system became operational over the period 1964/67 and provided the bases for a significant output of pioneering work in manpower planning.

This first system was never fully satisfactory and began to depreciate before it was completed (and inter alia it was based on two separate computers and personnel systems at Head Office and at Fawley Refinery) but the experience provided Esso with valuable know-how and led before the end of 1967 to a fundamental rethinking of the approach in building a personnel system, and a decision was taken to rebuild. This was reinforced by the recognition that the parallel but separate payroll programme systems were becoming inadequate, that a new generation of computers would require rewriting work anyway, and that the advent of Esso Europe would impose requirements unforeseen in the original programme. Simultaneously top management was becoming increasingly aware of the need for consistency in manpower reporting and accounting across the U.K. Group.

The period 1962/67 was thus one of hard pioneering which provided valuable experience as an indispensible foundation for further progress. That the system created was not ultimately viable is not surprising in view of the lack of outside assistance available and the internal difficulties to be faced, and what is now being done in Esso would not have been possible without the initiative and imaginative persistence and hard work of a handful of people who then tackled this unfamiliar and daunting task. It is a pity that this cycle of innovation followed by rebuilding should be echoed in so many organisations coming to grips with the problems of building computerised personnel data and manpower planning systems. No apology seems necessary,therefore, for devoting so substantial a portion of the present study to this earlier phase, since it is rich in implications of principle and lessons for others and may be more useful than a lot of detail about Esso's present system which could perhaps not readily be transplanted to other organisations.

The following points would seem valuable to highlight:

1. It would appear probable that the main personnel system resulted more from the foresight and enthusiastic persuasiveness of a few individuals than from a consciously-perceived need and commitment on the part of higher management at that state though it also owed much to the generally innovative and open-minded managerial climate within Esso. In setting up a system of this size and complexity managements need to recognise that commensurate reserves have to be committed, scheduled and budgeted, and adhered to. The appropriate administrative adjustments must also be made. Firm authority is often needed to obtain co-operation at levels at which data is obtained in order to establish the initial data stock. It would seem that during this initial period there was less than full backing and commitment since:

    a. The manpower planning group's output became merely an additional manpower information source paralleling existing ones - there was no one centralised source of consistently based manpower data and no one unique reporting responsibility.

b. The data bank never became fully established.

c. In retrospect the resources allocated would appear to have been both inadequate and intermittently applied - a system taking so long to set up begins to lose credibility since it is not in a position to be obviously and practically useful. It appears then to be a nuisance and a consumer rather than a provider of resources.

Thus such a system needs to be hit hard in the design and start-up phase, i.e. half the resources at this stage will produce less than half the results and it may never get off the ground properly. An alternative may be the pilot approach; it might have paid to have developed the Fawley end first and run it for a couple of years to get experience. However, the small and shrinking population-size of Fawley would have limited its applications and experience value.

2. During nearly all this period the Manpower Planning Group in fact consisted of one professional analyst and one clerk located within the Recruitment Division of Employee Relations Department. During this development period of the data system there was also a sizeable output of analytical work and model-building and several audits of the total manpower picture in the U.K. Group. Some of this was commissioned by higher management, but much was at the initiative of the manpower planners. Given the absence or partial absence of a computerised data system (although admittedly much use could be made of the payroll tapes)and the diffused, disparate and unreliable nature of the manpower data available obtainable manually from employing points round the British Isles (there was no one central personnel records system), this analytical output demanded much manual effort in capturing, processing and publishing data.

It is today apparently very difficult to make use of this earlier work for various reasons: data frequently appears to conflict between one report and another; much of the work is not dated; when dated the measurements have sometimes been taken at dates which do not facilitate comparisons with subsequent periods (i.e. they are not at a year or quarter-end); few of the data categories are defined, and source documents are not listed. This, combined with frequent intervening reorganisations and reclassifications and mass transfers or staff makes this work done only a few years ago virtually useless today save as a very general indication of what was happening to manpower, and it is impossible by now to recheck and rewrite the data and thus obtain fully reliable long-term trends and consistency, i.e. to recapitulate past populations.

There are lessons here for the day-to-day routines of manpower planners everywhere: it is essential to keep data systematically and to date and define it and keep records of changing definitions, classifications and organisations.

Much of this work was very detailed and sophisticated in scope and seems to be ambitious in relation to the data resources then available. Unfortunately it does not appear to have had much influence on management decisions and it is possible that higher management was not aware of some of it, or at least not aware of the potential for the future that it represented.

There must be a number of conflicts and circular arguments in the sort of situation obtaining: manpower planning and associated data systems must flow organically from the pressure of real needs; these needs must be perceived and experienced by higher management to obtain support and resources for action; unless some form of manpower planning and organised data analysis already exists the need may not be perceived, etc., etc. Certainly in the sort of situation outlined in paragraphs 1 and 2 above there were strong constraints felt by the manpower planners, reinforcing professional interest, to produce analytical reports and forecasts as soon as possible as a visible return on investment.

In hindsight, however, it would have seemed better to have warned management to expect no results for a couple of years at least and to have concentrated the slender resources available in building and checking out the system and its data bank. The present manpower planning personnel would also strongly have wished that their predecessors had spent any further available time on systematically assembling, tabulating and defining historical data scattered around the company but still available at that time.

It is, of course, equally dangerous to become obsessed by unnecessary accuracy and systems minutae ultimately unproductive in themselves. However, Esso is now convinced of the paramount necessity of a solid reliable and well-defined data and systems foundation, both for continuing routine but important services to management in manpower accounting, and for manpower planning investigations. They feel the latter should be confined at the start to that demanded immediately by management or by evident needs, or to that which is clearly highly profitable or very simple and quick to do reliably. Otherwise, so long as analytical and forecasting work and similar studies depend upon suspect data or intolerably onerous manual operations they should be deferred until both data and systems and programmes are reliable and functional in spite of the temptation to publish results or practice and develop techniques.

3. One may suspect that apart from the Refining function formal manpower planning was started in Esso a little ahead of its "natural" time, i.e it did not seem to begin with a strongly-felt need and certainly during this period it has the appearance of a foreign graft rather than of an organic growth. Symptomatic of this is that its role appears to have been that of a service unintegrated into company routines and duplicating or conflicting with other services. Thus during this period manpower returns and analyses were compiled by various bodies scattered around the Company on frequently incompatible bases, and the activities of the Manpower Planning Group were not seen as needing to be integrated with the corporate planning cycle and the various budget cycles. There was a growing confusion over manpower numbers which became intolerable once Esso Europe added its own requirements to the scene. It may be that more progress might have been made at this stage had formal manpower planning been fostered within the Comptrollers Department (who had a major share of the various responsibilities for manpower reporting and who also ran the Payroll system).

Also symptomatic was the development of the personnel data systems as entities separate from the payroll systems. Apart from the clumsy, expensive and error-generating necessity to create a monthly data tape abstracted from other tapes in separate systems and locations, the payroll and personnel systems must be integrated in this type of situation.

Nevertheless it says much for Esso's U.K. management that by the early '60's (and earlier at Fawley) significant resources were in fact permitted for what must have seemed to them at the time a highly experimental, novel and indeed idealistic project. This willingness reflects both the objective and forward-looking receptiveness to new ideas and young innovators that historically has marked the Company's activities in social and industrial relations areas, and also its preoccupations with manpower efficiency and costs already noted. This comparatively early experimentation which resulted laid a solid foundation of experience on which to build economically and effectively. Although not fully successful or utilised this first system did demonstrate the value of a systematic approach to manpower information and planning and the potential of the computer in these areas. It profoundly modified opinions, plans and procedures. In retrospect it was clearly embarked upon at the right time if future demands were to be met with confidence and know-how.

III. REDEVELOPMENT 1967/70

By mid 1967 the need for rethinking and reworking of the system and the general approach to manpower planning was becoming evident:

a. Esso wanted to switch to a new generation of computers (IBM 360/65's) in any event.

b. Separate locations and systems were clearly an unsatisfactory arrangement: the payroll side needed overhauling and the personnel side was rapidly becoming non-functional (poor updating, etc.)

c. Esso Europe's arrival was going to mean more and novel information requirements and pressures for more manpower planning as such.

d. The statistical basis of manpower reporting was unsatisfactory and complex and with additional Esso Europe requirements gave top management increasing difficulties in reconciling a mass of variously prepared manpower figures at a time when accurate monitoring and control was increasingly needed as a result of reorganisations, new business ventures and productivity-improvement programmes.

e. A change to a more complex system of salary administration was clearly likely, while the two salary survey programmes still needed improvements.

f. The setting-up of Training Boards and the work going on within the Ministries of Technology and of Employment on manpower classification and planning might make new demands on the Esso statistical resources; meanwhile Esso had begun to suspect that existing government statistics about manpower in the petroleum industry were inaccurate and unrepresentative.

Between mid 1967 and mid 1968 a number of key decisions and policies were formulated:

1. A redesign from grass-roots was agreed, on the basis of one integrated payroll/personnel system to cover all the Esso U.K. Group; detailed decisions regarding the system are described later. This would be flexible, maintain statistical continuity with the previous system and contain historical data and would provide a compatible basis for satellite systems covering salary administration and survey work, Esso Europe requirements, and possibly benefits and training systems, and would begin to become operational in January 1969.

2. When the internal situation of Employee Relations Department permitted, Recruitment and Manpower would be split. Meanwhile the manpower group would be expanded and would at all times contain a professional with computing background to act as a link with the Computing Group to enable Manpower Planning to provide a better advisory and interpretive service to the rest of the Employee Relations Department.

3. The Manpower Group would work to the following priorities:

    i. Help design and build basic systems and associated classifications and updating procedures etc. to get it working.

    ii. Assemble and rationalise essential data from 1966 onwards.

    iii. Meet specific Board requirements for manpower reports, forecasts and studies.

    iv. Help design and build the new salary administration and improvements to salary surveys (essential if E.R. Department was to cope with extra work while reducing manpower).

    v. Develop co-operation and understanding with data-suppliers, clients, fellow-users of systems and the Computer Group and Management. These first five priorities were of paramount importance.

    vi. Provide a service to Recruitment Division, to the rest of E.R. Department, and to other departments, in that order. Reduce time spent on non-Esso organisations requiring advice etc. on manpower planning (this was becoming time-consuming).

    vii. Develop forecasting techniques - increasing need foreseen.

    viii. Analytical work and development in mathematical/statistical areas within limitations of programme, data and manpower availability, and for strictly utilitarian and profitable ends.

4. A full-time team of analysts and programmers was set up and a work plan and schedules agreed, with a commitment to maintain continuity of effort and personnel during the design and commissioning period, and with the continuing commitment thereafter for system maintenance and development.

5. The Board issued a directive that the Manpower Group were to be primarily responsible for the Company's manpower data andwere to co-ordinate all manpower reports and returns etc., both internal and external. The Group then set up a system of regular

quarterly and annual manpower reports to management, with a consistent and defined format and defined reporting categories. These were important for control and feed-back purposes, gave a disciplinary framework for improving and rationalising manpower data, and the annual report provided a "shop window" of brief comments on manpower trends, on investigating work etc. done by the Group, and thus some indication of the service it would increasingly be able to provide.

6. Simultaneously Esso Europe was agreeing procedures with all the affiliate companies in Europe to make manpower reporting and planning a formally integrated part of the corporate and functional stewardship and planning procedures, with the Employee Relations function given the responsibility for co-ordinating the manpower aspects. An Esso Europe manpower data bank, with appropriate classifications and coding and input and reporting systems, was set up (EEMIS, or Esso Europe Manpower Information System).

These new policies and departures have been broadly successful and the targets laid down at end-67 largely met. Esso's new integrated system in the event started up a year later than scheduled, due to the need to give priority to difficulties encountered on the payroll side and the new salary system, and to the unexpectedly heavy workload imposed by setting up the U.K. end of EEMIS. The salary survey programmes are now closely integrated and are working well. Esso Petroleum's own internal manpower reporting system is working well and economically, and the complex monthly manpower reporting requirements of Marketing Department have been taken over by the Manpower Planning Division (which is now separated from Recruitment). The required standard of data reliability has been largely achieved. On the analytical side, useful services were provided in spite of the difficulties resulting from the deferred system start up; including important innovatory work, a major textbook on manpower planning (written by a member of the Division and recently published), and advisory work in connection with government ministries etc.

Continuity in this re-design and development work has been maintained in the systems and programming team employed and this has proved to be of great importance. So has the continuous employment since 1967 of one professional with computing experience within the Manpower Planning Division. This has given the Employee Relations Department facilities hitherto lacking of detailed participation in design, development and maintenance, in the monitoring of progress, and not least the combinations of skills within the Department has opened up fresh perspectives on computer applications in personnel work.

The workload involved in putting historical records into the bank proved too daunting and they had in any case become very inaccurate due to poor updating etc., and they exist from 1967 onwards only, but should be sufficient for many purposes, some essential pre-1967 statistical data being held manually (and, of course, individual manual records are available at employing points). Nor has it, in the event, proved necessary or cost-effective so far to set up a computerised training sub-system. On the other hand a very complex salary administration system is going forward on computerising benefits and pension administration, and an interesting and completely separate system for the manpower of the tanker fleet has been established.

It should be noted that there was no question of a complete discontinuity with the first system. Many of its fields and coding structures were utilised and there was in any case a continuous underlying accounting /payroll base of accounting codes and procedures.

This brings the preliminary historical description up to date and the remainder of the Case Study describes the current state of affairs.

IV. CURRENT OPERATIONS

The current operations of the Esso systems can perhaps best be discussed under three headings :

a. The methods employed to keep the system current

b. The use to which applications are put

c. The separate system for Esso Marine.

Following the redevelopment of the late 1960's, the system now is a fully integrated pay and personnel one. This is probably for several fundamental reasons.

The first is the reliability that is enhanced by the injection of accounting type disciplines into a personnel system. This reliability can best be described in terms of currency and accountability. By currency we mean that since input documents are linked to the day to day payroll type transaction, the tendency for the personnel portion of the system to be up to date is better. By accountability we mean that because of the above, the personnel portion of the file is always in accord with the payroll, making measures of stocks and flows reliable to a degree that would not otherwise be the case.

The second reason for integration is of course the geographic dispersion of the employing points in Esso, coupled with the lack of qualified personnel specialists (or indeed the need) at these points, (e.g. Service Stations). This means that adherence to a simple input document is easier to achieve and the degree of training necessary is minimised. The task of ensuring up to dateness of complex personnel records in such a situation is not justified.

A third and perhaps prime reason, concerns the high degree of overlap in the data categories required for a personnel information system and for a payroll system. Separate systems involve redundancy of information and diseconomy. Further, within such parallel but independent systems, the personnel system will lose credibility and thus becomes preferentially and increasingly less used because of the more rigorous accounting, updating requirements and immediate feed-back of any payroll system.

The reporting structure is on an employing point basis with one person at each employing location responsible for input into the central system on a standard locally coded form. This helps to ensure the accuracy of information on all aspects of pay and personnel. Input documents are received at the centre and are scrutinised and batch processed. This method appears to work well though the Manpower Planning Division has had to train and coach those responsible at submitting locations and spends a fair amount of time auditing the data bank.

Rapid access to the personnel modules of the system, apart from standard report formats, is done via the enquiry language INFORMATICS MARK IV which is a flexible access device for ad hoc information retrieval on an individual basis. Esso use this both for individual queries and non-routine statistical applications.

With respect to the record we can state that like the companion U.K. case (The Civil Service Department) the important features to consider are not so much the file contents but more the way in which the data are processed to become information, the way in which codes are designed and the value these codes have in manipulation without excessive machine time. For example it is becoming increasingly common for systems to employ unique employee identifiers, so there seems to be no need for special comment. Inasmuch as the system is payroll integrated, it takes no great imagination to envisage the sorts of common data that are collected and kept current. The contents of this system are outlined in Appendix 2.

Given that one of the main uses of the system is in the area of manpower planning and manpower inventories, the system caters extensively for the measurement of stocks and flows in terms of the quality, quantity and organisational attachment of manpower. Because of these dynamics, the overall system is multi-axial with sequential codes within the individual fields. Further, considerable work has been done on the refinement of the education, education level and qualification codes. This is primarily because in the main areas of application the emphasis in Esso is on the quantity of manpower.

The future plans for use of computing capability have to a large extent been catered for in the design of the system. The personnel file is modular in structure and as such can be viewed as a variable length file with fixed length fields. The modularity is achieved by designing several separate records which in total comprise the personnel field. That is to say there is a personnel record as one module containing personnel and organisation affinity data, an education record as another, an historical record as another, etc. This Approach would seem to have the facility to accommodate change and growth.

All the systems and programming effort has been domestic in the sense that no manufacturers programs were seen to be of value. This is excepting enquiry programs. Additionally, there was very little external influence in the design of the system. However, there were marginal influences; notably the previously mentioned requirements of Esso Europe with respect to the personnel modules and the increasing requirements of governmental agencies with respect to the pay modules (e.g. SET - Selective Employment Tax).

It may be thought inconveniently laborious and redundant that Esso Petroleum's Manpower Planning Division should have to work with two distinct systems of Manpower Information - their own and Esso Europe's. To a very limited extent this is true, and additionally for good reasons the basis of counting and reporting manpower for domestic reasons differs somewhat from that of EEMIS. Nevertheless the information needs, design requirements and coding structures of an autonomous self-contained enterprise on the one hand and of an inter-affiliate and international system on the other are as different as those of micro and macro-level organisations within a national economy. The individual affiliate Company can take many things for granted, e.g. its occupational and organisational structures should be so well defined and commonly understood that simple sequential codes will suffice to define their elements, and probably already exist in the accounting system, with consequent savings in storage, programming and running time. Thus job titles will suffice to identity job functions and similarly organisation titles will reveal organisational functions and possibly geographic and payroll etc. locations as well, if well-designed and consistently unique in the first place. An international headquarters organisation, just like a government department concerned with many industries, enterprises, locations and occupations, can take none of this for granted and must employ coding structures which are fully multi-axial and comprehensively inter-dependent, employing full use of functional concepts, and concerned with common factors that can be measured across the whole area of data capture.

It could be said, indeed, that Esso Petroleum's domestic system was perhaps too economically designed with minimum programming and computing cost to the fore, and to that extent some of the analytical and discriminatory power provided by the additional multi-axial EEMIS codes are proving most useful for domestic purposes quite apart from feed-back from the total EEMIS and the elimination of any remaining unnecessary overlap. A table of contents of the EEMIS system will be found in Appendix 1.

Up to now, in the interests of economy and of gaining operational experience and thus certainty as regards needs before committing and perhaps wasting scarce programming resources and expensive facilities, Esso has used few standard outputs (about 30 only) and has relied initially on fairly extensive manual manipulation of information coming off the machine for preparation of reports and analyses, backed-up increasingly by the use of Informatics; indeed Mark IV is so firmly structured into the system design by now that a high degree of flexibility and rapidity of response to requests for information is possible within the analytical and other limitations of first-level Informatics (higher level facilities are not employed by the manpower personnel themselves but are available to them).

Since 1967 experience has permitted a growing identification of the most essential data for managerial control and consequent reduction in volume of data routinely reported and simplication of formats (and a similar tendency is at work in Esso Europe). This has been helped by increased managerial familiarity with and confidence in the manpower information system and its accuracy and its useful feedback and analytical services and help, which is beginning to reduce significantly their own drudgery in manpower reporting and control (an improvement which is planned to go further yet, e.g. by the automatic production of updated individual record cards).

Such factors, plus operational improvements as successive stages of the system come on stream, have permitted a reduction by one person a year in Manpower Planning Division since 1968 to an end-1971 strength of one Manager, one Analyst and two support staff. This greatly magnifies the effects of workload peaks and it may be significant for others to note that with highly sophisticated mechanised methods and applications it no longer proves possible to cope with emergencies or peak workloads by drafting-in assistance from other Personnel Divisions or by temporary labour, except in very simple applications. It follows, too, that the Divisional personnel need to be highly specialised, trained and experienced, and this in turn creates career planning and interchangeability problems within a Personnel Department.

These difficulties with peak work demands and excessive overtime working at such periods are now enforcing the development of additional special programmes making increased use of the computational power of the machine, more standard outputs, and the use of visual display and rapid access facilities for ad-hoc analyses, continuous updating, and quick and easy adjustments to forecasts etc. as decisions are made or amended during the major manpower reviews (at present a single decision by the Board to adjust, say, the 1973 target for sales engineers during such a review results in around 150 manual calculations and alterations to the various tabulations in the review working against stringent deadlines). Workload pressures on such a small group with little flexibility of response to unforeseen demands etc. is also pointing up the need for even better feedback to field locations (and again computer-produced record cards should help) and far more rigorous validation programmes in order to reduce the continuing burden of manual data audit. Indeed, the introduction of visual display real-time updating is leading to a reconsideration of the present system of placing responsibility for coding of input updates with field-locations and the advantages of this may begin to swing towards centralised coding.

We cannot view Esso's use of computing capability solely as input-output vis a vis the pay/personnel system. The computer is in fact used in the effective management of Esso's manpower in many ways external to the system described. The majority of the on-going applications are in the areas of Esso's complex salary administration and manpower accounting. To put this activity in proper perspective it is necessary to describe briefly the role of the Manpower Planning Division in the Employee Relations Department.

The Division has no line authority but advises and assists managers in manpower matters and acts as the interface between the other personnel functions and the computer. This implies that the division gives advice on operational research/statistical type solutions to personnel problems and generally provides a basic data service.

Because of the nature of its function, the Division acts as the central depository and co-ordinator of manpower accounting for the U.K. This means that the Division has joint custodial responsibility with Comptroller's Department for the data bank. A separate EEMIS data bank is kept by Esso Europe, of which the British component is an extraction from the main Essopet system updated at each year end and with additional inputs for data not held in the Essopet system. The EEMIS data bank is accessible to Essopet and other affiliates when required.

When an individual function or organisation needs to supply manpower data to top management or an outside organisation such as Standard Oil New Jersey, Esso Europe, a Government Department or some other institution it is nowadays required by the Board first to check out its submission with the Manpower Planning Division. This ensures accuracy and consistency and adherence to policy lines etc. and has cut out past duplications of effort and confusions etc.

However, in manpower planning activities, the responsibility for the preparation of manpower plans lies with the particular functions or departments, not with the Manpower Planning Division. This is an important distinction. The Division supplies data with respect to stocks, analyses of flows, and forecasts - it is up to the line and functional authorities to use these data in preparing plans and forecasts which are then co-ordinated and reported by the Manpower Planning Division. With respect to the provision of data for all of Esso U.K. to Esso Europe, the responsibility for preparation and input of the twice-yearly manpower forecasts and measurement of productivity etc. rests with the Manpower Planning Division in its role as custodian of the data bank, while accountability for results against targets and the meeting of manning standards etc. remains with management.

In broad terms, applications can be described briefly under several main headings :

1. general
2. corporate planning and manning controls
3. recruitment
4. salaries
5. benefits
6. training
7. prediction and forecasting
8. Esso Europe

1. General

Quarterly reports are prepared and analysed with respect to monitoring actual manpower progress against plans and targets. Again, because the division has no line authority, it can only advise variances and recommend remedial action or predict likely trends if no action is taken.

Labour productivity and other labour economic trends are produced on demand and for management reviews etc., thus contributing to the role of providing an information service to the rest of the organisation.

At the request of other departments within Employee Relations and other functions, special studies are undertaken, for example analyses of the cost of female labour. Such analyses would include recommendations as to whether or not a change in policy should be considered with respect to their retention and recruitment. Other such studies might include cost analyses on redundancy programmes, special data for management development purposes etc.

2. Corporate Planning and Manning Controls

However, the biggest and most important workload of Manpower Planning Division lies in the very thorough system of manpower control which forms part of Standard Oil New Jersey's corporate planning system world-wide and which forms the background to Esso Petroleum's and Esso Europe's systems. Manpower stocks and costs are budgeted, planned and reviewed in detail along with capital, financial and operating budgets and plans, first at the level of the affiliate by functions and department, then of the Region, and finally world-wide, and of course Essopet's own manpower control system is integrated with this. Twice a year the annual budgets and targets throughout the Company are updated and agreed on a rolling basis (i.e. for 2-3 years ahead plus long-term lookaheads) and these are compared in turn one year with another and with actual results, and the latter in turn with existing targets, so that at each review there are five or six sets of comparisons to be examined and approved. Within Essopet manpower stocks and budgets are reviewed for some 30-35 subsidiary companies, departments and main divisions, and changes in stocks etc. analysed under the headings of Working for Other Organisations, Efficiency Improvement, Profit Improvement, Changes in Workload, and All Other Reasons. Productivity ratios and trends are calculated and manpower costs reported and forecast on the basis of stock figures and compensation trends. Qualified Professional Manpower is further highlighted and forecast in terms of stock, wastage and hiring numbers. Commentaries are added where necessary.

This is naturally a complex and demanding procedure, concentrated into around six or seven weeks twice a year against very tight deadlines. Manpower Planning Division co-ordinate, assemble and present the material for Board review and prepare the subsequent approved submission to Esso Europe of results and plans. Amendments during this accountability and budgeting review may be frequent and can involve much additional work under pressure of deadlines. The systems implications of so rigorous and searching an approach to the manning of the enterprise and to manpower costs will be readily appreciated, particularly in view of its compression into these short periods of intense activity, which has a marked impact upon so small a working group as the Manpower Division.

As a result of some years experience in the operation of this approach the burden both on managers responsible for the basic input of data and forecasts and on the Board as a reviewing body is being reduced by substantial simplication and reduction and rationalisation of data content and format, concentration on essentials and key ratios, commonality of terminology and codes, and simplified forms and paperwork. Such improvements depend upon the development of a relaxed confidence and understanding by all concerned regarding the underlying purposes of such planning and control tools, and upon confidence gained in the integrity of the data-base and methodology, and in the "neutrality" and service oriented approach of those who administer these. Manpower Planning Division's strongly-expressed aim is to help managers and relieve their burdens and gain their confidence and co-operation through good service, while maintaining objective advice and service to the Board, rather than to impose a bureaucratic inquisitorial and soulless system. More can yet be done, and is being planned, to ease the peak burdens on the Division itself at these reviews by more intensive use of the machine's capacity for rapid calculation and tabulation and for flexible adjustments on demand.

3. Recruitment

Studies have been made to analyse and advise upon advertising cost-savings strategies. Additionally, effective use has been made in studying methods, strategies and costs of graduate recruitment and the development of pre-selection methods. It should be noted here that this application is using the computer without the system with external input and the computer being used as a mathematician.

4. Salaries

There is an on-going highly complex system for salary review and salary administration that at the time of the interview had recently undergone some teething trouble due to the relative sophistication of the application but is now running very satisfactorily. Further work has been done in analysing the costs of jobs and the machine generation of trend lines and scattergraphs. Mention has already been made of the large and detailed salary surveys which are external to the integrated system.

5 & 6 Benefits and Training

In the case of benefits, there are several modules and an actuarial model in operation used by the Company's actuaries. In the case of training - needs of the system have been investigated, and it is thought unlikely that progress will be made due to the size of the population in question. The costs could not, in all probability, be justified in terms of benefit. This has at present a low priority.

7. Prediction and Forecasting

This is an area of activity in collaboration with external agencies in experimenting with mathematical manpower models, regression techniques, etc. Good progress has been made in the use of regression analyses for manning standards; less so in a predictive mode extrapolating past trends. Manning standards typically involve regressions of manpower in the various functions against appropriate business factors e.g. investments, sales volumes, plant throughputs, ton-miles transported, customer transactions etc., thus enabling progress to be measured, inter-affiliate comparisons to be made, and targets and accountability established. Similar standards for qualification/education within the managerial-professional workforce have been in use since 1967. There are many unsolved problems and increasing demands in the measurement and prediction of the internal dynamics of the manpower stocks. A programme of research and development is now commencing in order to model manpower dynamics. Several inter-connected models grouped around a basic core model are envisaged, embaracing qualitative as well as quantitated aspects. This is a co-operative effort by Esso Standard Italiana (who already have two independently developed models in use) and Esso Petroleum under the co-ordination of Esso Europe and in association with the University of Kent (Prof. Bartholomew) and the Institute of Manpower Studies. Such a flexible system of models would provide for a number of needs and a common methodology of Esso across Europe. Manpower models are perhaps as valuable in providing understanding and insights into manpower phenomena as for prediction of events per se, and depend heavily upon (and may profoundly modify in turn) a sophisticated data base and system. Essopet hopes inter alia to provide better back-up for its important management development procedures.

Developmental work has also been undertaken in the area of macro-occupational classification systems and coding structures as the Division sees that these must be got right nationally if computer data banks are to function adequately in the counting and classifying of manpower.

8. Esso Europe

Apart from the annual and longer term manpower forecasting and periodic accounting of manpower, there has been much development of systems providing effective manpower quality standards and manning (productivity) standards. Additionally the costing of manpower in European affiliates has been further developed.

Esso Europe's objective has been met in achieving a computer based data system for all European affiliates. Manpower accounting (e.g. numbers reporting) is spot on, and the understanding and integration of common data bases within the different countries is having a powerful effect in stimulating efficient and economical utilisation of manpower and improvement of its quality throughout Esso's European operations.

From Esso Petroleum's viewpoint, the provision of data to Esso Europe does create additional work, but there is compensation in terms of feedback on comparative performance (manning standards, etc.) and other useful services, and in addition the EEMIS codes provide analytical facilities which would otherwise require incorporation into the Esso pet system.

V. THE INDEPENDENT MARINE SYSTEM (F.E.R.S.)

It is important to note that although Esso's Transportation Department is an integral part of the Company, it has quite independently developed - and operated since September 1970 - an entirely separate computerised personnel system for its tanker fleet known as FERS (Fleet Employee Records System). This independent development has precluded inclusion of costs, either developmental or operational, of this marine system in the cost survey which forms Chapter IV of this study.

This decision to create a Fleet Employee Records System independently of the main Esso system may seem surprising, particularly as the Fleet's payroll operates through the main system and indeed Fleet personnel data to operate the system for corporate reporting and budgeting etc. Apart from additional costs and work there are other built-in potential disadvantages in such dual systems in that the one relied upon for day-to-day operations will probably receive strong updating priority at the expense of the reliability of the data in the other. Further divergencies may well develop in classification and other methodology which can lead to endless difficulties. In spite of such dangers and drawbacks FERS is operating successfully and all bodies concerned - Transportation itself, Comptroller's Department's Payroll and Computing Divisions, and Employee Relations Department's Manpower Planning Division, appear to be living with the situation without difficulty. There were a number of strong reasons why this separate development and duplication occurred, and the peculiar and interesting manpower problems posed by petroleum tanker fleets need also to be understood.

1. Background

Marine applications pose some interesting and difficult problems for the systems designer. These arise mainly from the complexity and urgency of operating requirements. (Indeed, as will be seen later, the problems posed are not altogether unlike those in a military or naval operations situation).

Esso Petroleum maintains a transportation establishment "regular employee" of about 150 Shore Staff (e.g. fleet management, suppliers, services, administration, communications and the like) in addition to 1,700 seagoing personnel. About one half of the latter are deck and engineering officers and one half ratings. Radio officers are employed on an agency basis and also at any one time there will be some seagoing personnel in temporary or contractual employment due to workload peaks and tanker chartering. The fleet operates world-wide, consisting both of owned vessels and chartered vessels (with or without chartered crews).

2. The Problems

The problems surrounding manpower in Esso Marine can be shown under two main headings - and both are highly interdependent:-

a) The nature of the oil business which requires great flexibility and changes at very short notice in routing and ports of call, mix of tonnage and cargoes, charter arrangements, etc.

b) The nature of the shipping industry and various trade union agreements and Esso Company policy which all call for; a great deal of training both at sea and for lengthy periods ashore; comparatively generous leave periods to balance long periods at sea (lengthy tanker routes plus very rapid turnaround in port); and, a substantial reserve of officers and ratings on "stand by" ashore, ready to man emergency situations at very short notice.

One may add to these factors the high labour turnover and recruiting difficulties, characteristic of the shipping industry, Esso's pioneering of small, highly trained and highly flexible crews, and the existence of mandatory qualification requirements for seagoing officers. Above all, the underlying economics are such that, compared with most shore or merchant navy operations, any delays or dislocations in planned operations are enormously expensive. Personnel and manpower planning requirements are thus critical in a petroleum company's tanker fleet.

The difficulty becomes one of gauging manpower supply, demand and deployment in the face of such things as construction delays, collisions and breakdowns, delays at shore terminals, unexpected sickness and accidents, labour market difficulties, lengthy training and leave periods, chartering problems, etc. Thus the effective manpower management of such a fleet requires:

a) frequent and accurate situation reports on its manpower (e.g. levels of qualification, numbers and levels in training, percentage on stand by, average crew sizes for different classes of tanker, sickness and turnover rates, forecasts of numbers returning from leave, etc.) and even more vital -

b) an accurate knowledge of the whereabouts, availability for duty and qualifications of every member of the fleet at any given moment, so far as this is possible, for the purpose of rapid deployment of people world-wide.

These requirements demand excellent communications (which of course exist in such a fleet), the presence of managers with the authority and experience to make instant deployment decisions (who are also available) and an information system containing the required data categories with facilities for instant update and instant access. In systems terms there is a "real time" situation to be met.

This demand was met originally by manual records. Specifically, these records were extracts of the most essential data kept in loose-leaf files in the form of personnel lists. These files were carried about by the managers and updated manually by them on the spot as radio messages, telephone calls etc. came into the Operations Room. The main records were subsequently updated daily from each manager's file, which was then itself updated by the insertion of fresh sheets. It seems that this manual system worked quite effectively for some years.

However, Esspet's approach to fleet management and operation is highly sophisticated and efficient in all areas, whether that of economics, of design and technology, of vessel operation, of managerial techniques, or of human relations and the effective use of manpower resources through the application of social science and manpower planning. In these latter human areas it is probable that only the Israeli Merchant Navy among civilian fleets can rival the pioneering work is Essopet. Such considerations on top of the normal operational ones had begun to make heavy demands on the manual records and methods hitherto used, and it was foreseen that more sophisticated and flexible means would be required in the future, with easy and rapid access, updating and analysis of data for increasing statistical demands. As a records system, in addition to assignments, promotions, salary reviews and discipline there were increasing requirements in the areas of career development, training and manpower planning. In the latter sphere there was the need to develop better predictive methods and the stimulus of Esso Europe work on manning standards. Particularly cogent was the pressure for manpower optimisation and the need to develop appropriate techniques for allocating men rapidly to ships within constraints such as fulfilling skill/qualification/complement requirements, minimising wage costs, and minimising costs of repatriation and awaiting assignment.

During 1968 the question of utilising the main system, whose design was largely fixed by now and whose development and programming were well under way with some parts operational, was examined and rejected. Unfortunately the potential for modification of the main system and the flexible and rapid response inherent in Informatics and Visual Display Units were perhaps not fully appreciated at that time. There were strong pressures to get a Fleet system operational as soon as possible and Esso's computer systems and programming people felt in the end that the work involved in integration would mean delaying start-up to a point unacceptable to both users. The clinching argument from Transportation's viewpoint was that Tanker Department of Esso International N.Y. (Standard Oil New Jersey world-wide fleet co-ordination etc.) had developed a working system of computerised records for fleet use. While on a smaller and less ambitious design than that needed by Essopet's fleet it could be adapted and enlarged with presumably little programming effort and certainly small cost to Essopet since the basic development was already written off. In the event adaptation was not all plain sailing and FERS started up in the Fall of 1970 somewhat after the main system and ran in parallel with the old manual system for about a year thereafter.

The system contains common basic record data (with some items additional to the main Esso system, e.g. home address and other extra locations, passport details, data on marine qualifications etc.) plus detailed career and training history modules, and performance and promotability evaluations. The main record is on disc store with instant access and facility for update through a Visual Display Unit, updated manually once a week with update master stored on disc for ad hoc enquiries and in real time. There are regular weekly outputs on movements, assignments, forecast terminations of leave - and the like. Immediately essential information is thus held on disc store with instant access via a Visual Display Unit console available six hours a day between the hours of 9 a.m. - 5 p.m. with automatic print out facilities. Informatics Mark IV is also used for producing ad hoc reports and statistical returns.This system handles about 100 updates daily.

To an outside observer, and in retrospect, it would seem that for less than 2,000 employees, even given the complex and urgent operational requirements and the overall economics of petroleum fleet management, it might have been more prudent to:- add a few data categories to the main system; use its (the main system) weekly update cycle facility; and, maintain daily situation reports and deployments on loose-leaf printouts as daily work sheets (although if fully exploited, the Visual Display Unit could, in all probability, more than earn its keep for real time purposes). This would have provided quickly and easily an intermediate stage with which to gain experience on which to build more complex responses to these interesting fleet problems as they developed. However, in the corporate interest world-wide it may well turn out that this imaginative project will extend Standard Oil New Jersey know-how in an important and specialised area. Meanwhile we understand Essopet intends to re-examine the possibilities of much closer integration of this system with the main system: there could well be cost reduction and other advantages in so doing.

VI. CONCLUSIONS

Perhaps the most significant observation we can make about the Essopet case is that the general approach and the resulting system could best be termed organic - it grew and was nutured by its own needs. The underlying philosophy is that one can only plan in advance for main comtemporary requirements; one cannot forecast with any degree of accuracy scope and size of demand. The companion U.K. case (the Civil Service Department) also subscribes to this view - vide their assertion that management cannot say what it wants until the problem arises - and has attempted to tackle the problem with a seemingly highly flexible, and expensive in terms of store, file design; whereas Esso views this dynamic situation as one where the system itself will modify and be modified by these demands - that is to say by adopting an evolutionary and modular approach with no fixed limit fields. We must assert that both are valid approaches to the same problem and that there is no one right answer. The test is one of answering the fundamental question - does the system meet its design specifications and within reasonable costs? Thus we must compare the two against their own standard and not against each other. The C.S.D. system aims at a totally integrated pay and personnel information system for management; Esso's system was designed to provide an integrated pay and personnel system that focuses on the provision of manpower statistics with some (albeit growing) personnel information - thus using the data and the machine primarily for statistical and mathematical purposes.

We would think that the importance of these observations to future users is that managements must be quite sure about what they want the system to do - and that these requirements meet a definite need. Such decisions must be based on a thorough investigation not only of the economics (not necessarily theoretical savings - but assessment of real costs) but also of the suitability of a computerised approach (we use the term suitable because it is always feasible to computerise a drill or routine, but not necessarily very suitable).

From the description of the main system in Part IV and of the marine system in Part V it is clear that Esso's thinking and methodology has been evolving with experience, and perhaps it could be argued that many of the present and planned developments could have been foreseen and build-in during initial design and development in 1967/68. However, it is doubtful if for example the flexibility and potential of Informatics and visual display/access could have been fully comprehended at the time - technology is progressing fast. At that time, too, there was little published experience from elsewhere to draw upon concerning the design and operation of manpower systems (which is indeed the main reason for this paper). Esso's manpower and computing personnel feel quite strongly that ambitious elaboration of design at that stage might have turned out in retrospect to be wasteful of money and time, and particularly of scarce programming resources, and put back the effective meeting of urgent needs. They believe that their gradualist and evolutionary approach of building on experience and responding in a pragmatic way to changing circumstances and improving technologies as they occur is likely to be better in the long run. Certainly from the cost data Esso appears to have achieved a great deal of practical value very economically indeed, and double the expenditure and effort might not have achieved much more of real significance and utility.

Secondly, we would like once again to state our view that, based upon our observations of Esso and other systems (apart from the other U.K. case) there seems to be overwhelming disadvantages in having separate pay and personnel systems. Prime among our reasons for advocating this approach are simply that: 1) separate personnel systems cost more to programme and in the sense that one tends to attempt too much expensive flexibility that is never fully exploited; 2) there is excessive and needless duplication of files, coding and classification that leads in the end to confusion and inaccuracy (e.g. the two separate systems will never agree); and 3) the self-regulating accuracy inbuilt in all payroll systems will cause them to dominate and be used for personnel applications, leading to the decay and loss of credibility of the separate personnel systems.

The remainder of our conclusions are centred around some highlights of the Esso system that seems to work well and will perhaps be of informative value to potential users :-

1. There ought to be joint responsibility for the data bank and its security (pay and personnel).

2. There ought to be one centre responsible for the co-ordination and storage of all manpower data and reporting to enhance consistency and accuracy.

3. The accuracy and adequacy of manpower data is paramount. To help this process, one ought to concentrate on input and output, training and audit procedure, and validation routines. Also essential is the feedback of needed and useful information to data sources and suppliers. This is the practice of the notion that an incentive to accuracy and promptness of input and an acceptance of workload imposed on data suppliers is the provision of information that is evidently useful and practical.

4. The design and start up team ought to be comprised of well mixed disciplines and be seconded full time from each function concerned. This ensures continuity, which is vitally important.

5. It is desirable to have some one in personnel full time who has computer know-how (but not necessarily detailed skill).

6. Esso seems to operate well without a parallel position or "establishment" file by using annual stock targets plus definable job titles unique to a definable organisation.

7. Data comes from submitting locations who are accountable for its accuracy and are thus responsible for coding before input - an approach which has suited the development of this system to date but which may be less effective than central coding given the use of V.D.U. facilities.

8. Because micro systems are on shorter time cycles and incorporate more detailed and complex facts than macro systems they can supply data to the latter without incorporating the macro system codes, etc., within the micro system (which can be very expensive). Manual look up tables can usually specify data required.

9. The difficulties faced by Esso - and indeed in most of the other case studies - have been primarily those of classification. This points to the real need for either compatible national or international systems or for users to establish better dialogues between themselves. As we pointed out in the C.S.D. study, it seems a criminal waste of time and money to duplicate problems solved or at least partially solved by others. Typical of Esso's classification problems were :-

a. Education and qualification data deriving from technological and commercial needs (of great importance in Esso). It is also difficult to classify, and relate internationally, complex British qualification levels.

b. Difficulties in defining interfaces of "technicians" and "professionals", and first line supervisors of manual or clerical occupations whose job or personal attributes might be regarded as "professional."

c. Problems of relating and separating job and organisation function and job and organisation title, then relating these domestic identities to the Esso Europe system.

Finally we feel that it is important to future users to begin dating and defining data now or there will be problems arising from changing organisations and classifications. Future users should also decide now never to discard data: past population events and flows are extremely difficult to reconstruct. It is very expensive to keep history within a current record. Esso had planned to tackle this aspect by creating leaver-history tapes each 12 months but has since found it both possible and advantageous to keep leavers data from the start-up of the system onwards on the current tape. They now envisage creating a leaver history tape perhaps once every four or five years.

Appendix 1

ESSO EUROPE MANPOWER INFORMATION SYSTEM

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INTRODUCTION

EMPLOYEE DATA SECTIONS: SECTIONS

DATE OF DATA No.1
AFFILIATE/SUBSIDIARY CODE No.2
EMPLOYEE NUMBER No.3
LOCATION CODE No.4
ORGANISATION CODE No.5
OCCUPATION CODE No.6
EMPLOYMENT STATUS No.7
SALARY GROUP No.8
MAN-YEAR EQUIVALENT No.9
GROSS SALARY No.10
BASIC SALARY No.11
EDUCATION No.12
EMPLOYMENT SOURCE No.13
EMPLOYMENT DATE No.14
BIRTH YEAR No.15
SEX No.16
CITIZENSHIP No.17
LANGUAGE PROFICIENCY No.18
SALARY CHANGE DATA No.19
TERMINATIONS/SEPARATIONS No.20

AGGREGATE REPORTING REQUIREMENTS
DUE DATES/SUBMISSION PROCEDURES
DATA VALIDATION SHEET (Limited Distribution)
APPENDICES

Appendix 2

ESSOPET FILE LAYOUT
PERSONNEL RECORD

PERSONNEL RECORD - MASTER FILE LAYOUT

		RECORD LENGTH	
011	BASIC MASTER INFORMATION -ORGANISATIONAL	201	See attached breakdown
012	BASIC MASTER INFORMATION -PERSONAL	255	See attached breakdown
021	FAMILY SPECIAL INFORMATION		
031	LANGUAGE QUALIFICATIONS	35	
032	QUALIFICATIONS	44	Academic & Professional - Level, Type, etc.
051	STAFF PERFORMANCE REVIEW	39	
052	SALARY PROPOSAL	26	
071	ANNUITANTS PAYROLL	132	
091	MARINE	24	
111	SICKNESS/ABSENCE HISTORY YEAR TO DATE	82	
112	SICKNESS & INDUSTRIAL INJURY STATUS & ENTITLEMENT	106	
131	BASIC SALARY	57	
151	ALLOWANCES	205	
161	ERB RATES	31	Earnings - related benefits (Social Secuirty)
171	PENSION	167	
172	PENSION TRANSFERS	52	
173	PENSION BEARING PAY HISTORY.-5 YEARS	107	
191	TAX & GOVERNMENT PENSION	94	
192	TAX & GOVERNMENT PENSION - P.58	120	
211	NATIONAL INSURANCE AND S.E.T.	73	= Selective Employment Tax
221	SAYE	34	= Save As You Earn
251-271	SAVINGS - EMPLOYEE	59	Other savings schemes
252-272	SAVINGS - DEPENDENT	62	" " "
291	LOANS -PERSONAL	67	
292	LOANS -CAR	75	
311	B.U.P.A.,MINST,RENT	80	Private Sickness Insurance, Housing, etc.
[illegible]	OTHER VOLUNTARY DEDUCTIONS	147	
[illegible]	[illegible] DEDUCTIONS	[illegible]	

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     PERSONNEL RECORD - MASTER FILE LAYOUT
371            NON-TAXABLE ALLOWANCES                          69
391            CURRENT PAY PERIOD - EARNINGS (VOUCHERS)       175
411            HOLIDAY ENTITLEMENT                             37
511            BANK INFORMATION                                72
611            ADDRESS                                        134
612            THIRD PARTY NAME & ADDRESS                     121
711            OVERTIME HISTORY                                47
811            EMPLOYMENT & SALARY HISTORY                    119
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012               BASIC MASTER INFORMATION PERSONAL
      EMPLOYEE REFERENCE                    Pension Plan No.                          6
      RECORD REFERENCE                     MAIN MOD 2, SUB-MOD 1, SEQUENCE 2          5
      TITLE                                MR.MRS.MISS                                4
      NAME                                 4 INITIALS,1 BLANK,25 SURNAME             30
    C SEX CODE                         14                                             1
      DATE OF BIRTH                        YY MM DD                                   6
    C MARITAL STATUS                   15                                             1
      WIFES DATE OF BIRTH                  YY MM DD                                   6
      NO.OF DEPENDENT CHILDREN                                                        2
      DATES OF BIRTH OF CHILDREN           YY MM DD  UP TO 6 ELDEST FIRST            36
    C CITIZENSHIP                       7  EEMIS CODE                                 3
    C HIGHEST LEVEL OF EDUCATION       73                                             2
    C LAST PREVIOUS EMPLOYMENT          8  EEMIS CODE                                 7
      CHRISTIAN NAMES                                                                30
    C NATIONAL INSURANCE RATE TYPE     44  NORMAL SPECIAL ETC                         1
    C N.I. RATE CODE                   45                                             2
      AMOUNT OF EXPENSES ADVANCE                                                      8
      DATE OF EXPENSES ADVANCE             YY MM DD                                   6


                                                                                    156
```

011 BASIC MASTER Information-Organisation

c = code exists		code ref. no.		
	EMPLOYEE REFERENCE		PENSION PLAN NO.	6
	RECORD REFERENCE		MAIN MOD 2, SUB-MOD 1, SEQUENCE 2	5
C	COMPANY CODE	1	ESSOPET,CLEVELAND,ETC.	2
C	LOCATION	2	PAYROLL LOCATION	4
C	ADMINISTRATIVE LOCATION	42		4
C	DEPARTMENT	70	MAJOR 2, SUB 4	6
	LOCAL REFERENCE NO			4
C	ORGANISATION CODE	3	BEMIS CODE	3
C	MAJOR DIVISION	64	CORP.MKTG.REFINING ETC.	1
C	H/O FIELD CODE	65		1
C	LONDON/PROVINCES CODE	66		1
C	OPERATION TYPE	68		2
C	REGION	43		1
	SALARY PLANNING CATEGORY			2
	L.V. INDICATOR			1
	DATE ENGAGED		YY MM DD	6
	ADJUSTED DATE ENGAGED		YY MM DD RE BROKEN SERVICE	6
C	WORKING STATUS	12	SICK,LEFT,ETC.	2
C	REASON CODE	4	LEAVERS CODE ETC.	2
	DATE LEFT COMPANY (FOR F.A.)		YY MM DD	6
C	EMPLOYMENT CODE	11	REG.TEMP.CASUAL ETC	1
	SALARY GROUP			2
C	JOB CODE	6+63	DIFF. LISTS FOR MONTHLY/WEEKLY	5
	JOB DESCRIPTION			20
C	PAYMENT TYPE	13	MONTHLY,WEEKLY,ANNUITANT	1
C	METHOD OF PAYMENT	10	CASH,CRT.TRANSFER,GIRO ETC.	1
C	PROCESSING CODE	16	ACTION THIS EMPLOYEE OR NO	1
C	ASSIGNMENT CODE	67		1
C	AFFILIATE ASSIGNED TO	5		5
C	SALARY REVIEW GRADE	71		1
	OCCUPATION CODE			6
	EXPENSE CODE		FOR EXPENSE ACCOUNTING	4
	PREVIOUS EXPENSE CODE			4
	DATE CHANGED EXP.CODE		YY MM DD	6
	PREVIOUS LOCATION			4
	DATE CHANGED LOCN.		YY MM DD	6
	BASIC WEEKLY HOURS		2.2	4
	PREV. WEEKLY HOURS		2.2	4
	DATE WEEKLY HOURS CHANGED		YY MM DD	6
	PREVIOUS SALARY GROUP			2
	DATE CHANGED SG		YY MM DD	6
	NATIONAL INSURANCE NUMBER			9
	RECORD DELETION INDICATORS		TAX,PENSION/MANPOWER,N.I.	3
	GIRO A/C NUMBER			9
	PENSION CERTIFICATE NUMBER		ANNUITANTS ONLY (XX XXXX XX	9
C	PREVIOUS COMPANY CODE	1		2
	DATE CHANGED COMPANY		YY MM DD	6
	TAX CODE			4
	SEX AND WORK CATEGORY			1
	LIBYAN OVERTIME STATUS			1
	N.I. STAMPS			2
				221

THE DEVELOPMENT OF ELECTRONIC DATA PROCESSING IN MANPOWER AREAS

(A comparative study of personnel information systems and their implications in six European Countries).

Case: Civil Service Department, United Kingdom

CASE STUDY NO. 8

London, June 1972

J.E. Bayhylle, Unigate Ltd.
A. Hersleb, Esso Petroleum (U.K.) Ltd.

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> "It is not possible to design a system to provide management with what it wants. Management cannot say what it wants until the problem arises."
>
> N.E. Davies, Head of Defence Data
> Processing Service,
> U.K. Ministry of Defence.

I. BACKGROUND AND HISTORY

1.1 The Civil Service Department

Until the Fulton Report*, all personnel management functions as were performed on a central basis were carried out by the then Pay and Management Group of the Treasury. However, the report in its main findings (see Appendix I to this case study for an extract of this report), recommended that a new department, the Civil Service Department, should be set up with wider functions than those currently being performed by the Pay and Management Group. The report also recommended that the new department "devote more resources to career management of all civil servants."

Accordingly, all the main personnel management functions of the Civil Service are to be carried out by the Civil Service Department, such department formed in 1968 as a direct result of the Fulton Report. This department operates broadly in two ways :-

1) By ensuring common policies and practices are carried out in the best possible fashion - e.g. selection, training, promotion, superannuation, etc.; and,

2) To provide to all departments a problem solving and advisory service in the field of management techniques and organisation, applying such to other departments either collectively or individually.

Further, the overall control of manpower, in terms of numbers, rates of pay and grading structure, is the responsibility of the Civil Service Department.

1.2 The Pre-Fulton Organisation

As stated above, the main personnel activity was devolved from the Pay and Management Group of the Treasury. Because the department to which people are assigned was (and still is) deemed to be the employer, this not unnaturally led to the development of a number of records systems of varying form and content and accuracy. Such systems were established to meet the particular and peculiar needs of each department. This development was characterised by a wide variety of manual, single purpose records systems.

---

* The Fulton Report, Cmnd 3638,HMSO London, June 1968.

To say the service was inefficient - as may be implied from the above - is to over-generalise. Notable exceptions to the situation described above were :-

1) The computerised systems under development by the then Ministry of Technology and the Ministry of Defence.

2) The Civil Service Central Staff Record (CSCSR) - a punched card system introduced in the 1940's and recently transferred to a computer,carrying limited details of all civil servants.

3) Approximately 450,000 of the total of about 500,000 non-industrial civil servants (the part of the Civil Service we are concerned about in this study - broadly, non-manual employees) had pay records on computer systems, but had no link with personnel systems, which were strongly decentralised and in most instances supported by manual records only.

It is with this background in mind that PRISM (Personnel Record Information System for Management) can be discussed.

1.3 The beginning of PRISM

In June 1966, the then Management Service Division (Computers) of the Treasury Department submitted a paper which outlined the possibilities of a Civil Service-wide computer-based system for personnel information. The concepts of such a system received general support and approval was given to set up a working party of investigation.

Eventually, in the summer of 1967, authority was given to recruit a project team whose terms of reference were broad and far-reaching. The team were asked to report not only on the feasibility and economics of providing a computer-based personnel information system, but to report also upon the way in which telecommunications and computers could best be used to provide such a personnel information system for the efficient management of the Civil Service as far ahead as could be foreseen. As it emerged, the report, submitted early in 1969, forecast costings and requirements for 10 and 18 years, and recommended implementation in two five-year phases.

Effectively, the feasibility study spanned over 1968-69, with a team of 10 people of varied experience in computers, personnel and O & M work, drawn from a number of government departments - e.g. Board of Trade, Land Commission, Treasury, Inland Revenue and Ministry of Defence. Two outside consultants were also engaged on a part-time basis during the study to advise on certain aspects.

It should be noted that during the study, the implications of the main likely findings of Fulton were known already by the team. The principal result of this knowledge was the realisation that the current personnel record systems would be inadequate to support the recommendations of Fulton, and that some form of service-wide computer-based personnel information system would be needed if the emerging Civil Service Department and other government departments were to implement all the new policies effectively.

The recommendation of the feasibility study was to establish and provide an integrated computer-based pay and personnel information system for the whole of the U.K. based non-industrial staff of the Civil Service which would meet the needs of both individual departments and central Authorities, principally the Civil Service Department. The system has been named PRISM (Personnel Record Information System for Management). Approval was granted to implement Phase I and to undertake preliminary planning for Phase II.

1.4 The CMSR and PRISM

Although this study is mainly concerned with the development of PRISM, we feel that mention must be made of CMSR (Central Management Staff Record).

As a consequence of the Fulton recommendations, approval was given to proceed with the establishment of central computer-based records for senior civil servants (approximately 6,500 at first, since extended to about 9,000). Accordingly, the CMSR was planned and became operational on 3rd August, 1970. It was felt that such a system would serve immediate management needs and would provide valuable pilot project material for PRISM. This system operates on an ICL System 4/70 computer and uses a domestic flexible retrieval programme language SPECOL to select records according to specified characteristics and either print these records (in whole or in part) or to produce counts from them. Access to the records is normally by remote terminal through Post Office lines.

The record is updated manually and has no link with the pay systems or CSCSR mentioned earlier (para. 1.2).

II. PRISM

2.1 Philosophy

The major basic philosophy underlying the concept of PRISM is the absolute necessity to integrate pay and personnel records, up-dated from single source documents, if accuracy is to be achieved.

There are other philosophies and concepts which will be discussed at the appropriate place in the study.

The awareness of need for accuracy and reliability of manpower - the effective management of people - information, causes one to find a different yardstick from money to justify a system of this magnitude: or for any computer-based personnel system for that matter. The implication here is that if management is to have information on which to judge and make decisions - such information must be reliable, and with known and acceptable reference data.

2.2 The Concept

The requirement and consequent design basis is, broadly:

> Provision of payroll and personnel information on a computerised basis for some 500,000 non-industrial civil servants, of whom roughly a third are weekly-paid, across some 16 major government departments and agencies wholly or partly computerised already for payroll, or sharing computer facilities, plus a large number of minor ones, many of which are not computerised. Many or most with computerised payrolls have manual and usually separate personnel records; there is a small existing computerised system (CMSR) across departments for top grades in the Civil Service to be absorbed as well.
>
> These facilities are to be provided in a "federal" configuration and in an "integrated" system.
>
> "Federal" is used in the sense that the present number of individual payroll and records locations will be much reduced by grouping them and using a common computer data bank and payroll records location for each group (perhaps no more than 4-5 groups, ultimately), which will then abstract and feed selected personnel and payroll data to a central or master computer and data bank for the Civil Service system as a whole (maintained and used by the Civil Service Department in its role as the Central Personnel Management and Manpower Planning department for the Civil Service).
> Primarily statistical information of common interest will be fed back to the peripheral locations and there will be facilities eventually as well for interchange of data between computer locations in the resulting communications network.
>
> The system will be "integrated" in the sense that:-
>
> a) The payroll and personnel administration and records, both centrally and at each computer location, will depend on common data banks,

common classifications and codes, updating and other methodology, etc. and a common communications network. Thus the pay and personnel aspects will be fully integrated.

b) Any existing manual pay, and eventually most personnel records, will be computerised and the present central CMSR system will be absorbed.

c) Over the longer term, hardware and software will be largely standardised within limitations of cost and practicability as existing machines and equipment are gradually replaced on a scheduled basis.

Provision of information for management and for the personnel and accounting functions as follows :-

a) Statistical - routine reporting and outputs (over 100 regular outputs within CSD have been identified so far).

b) Statistical - non-routine investigations, manpower planning, mathematical applications, etc.

c) Individual - with rapid response, for ad hoc queries, career planning etc.

Built-in flexibility for use and expansion, particularly as regards extraction modes and response-time, since future growth and scope of demands cannot be foreseen reliably at design stage.

Start-up of design and construction, i.e. beginning of Phase I, end-1969.

Start-up of System developed during Phase I (payrolls and basic personnel records covering all non-industrial staff at 10 - 11 peripheral locations and basic overall data bank at the centre) end-1974.

Further development of System (full payroll and personnel records; possibly 4-5 peripheral locations and full-scale departmental and Central facilities), i.e. Phase II, 1975 to 1979.

2.3 Phase I

It would be extremely difficult to distill all the information contained in the proposals for PRISM contained in the feasibility study - it is in three volumes and runs to 65 appendices - several hundres of pages in all. A secondary report discussing the PRISM file structure is voluminous. Our case study aims to discuss the progress made with PRISM Phase I, some of the underlying thinking behind Phase II and to discuss the concept of the PRISM file; then, finally to see what sort of general conclusions can be made from the wealth of information given to us.

If the summary background notes seem inadequate, this has been deliberate to an extent because the progress made to date is inextricably linked with the past and the point where discussions on the value and concept of PRISM begins and the findings of the feasibility study ends is not decisive and clear; nor should it be. A good study discusses feasibility in technical, operational, philosophical and economic terms and if these observations and findings are to have any degree of validity they must relate recommendations to past deficiencies and strengths. Fundamental to change is the need to change; such decision is made only after consideration of all available facts. Change also does not imply alteration in toto - one should build on strength to minimise deficiencies - not discard all that has gone before. Thus, the description of PRISM Phase I must of necessity make reference to the circumstances extant at the time of our study. In this fashion we hope to build a composite picture of a highly complex, dynamic system.

To record the prime objective of Phase I is to undervalue the time and effort employed in reaching that state. But for the record, Phase I was planned to encompass 1970-1974, and accomplish quite simply two things :-

1) To have all non-industrial (500,000) staff on computer payrolls with an integrated, but limited personnel record for each person.

2) To undertake further planning for Phase II to ensure smooth transition, especially focusing on standards and standardisation of records and codes.

The first objective can be expanded to include the following sub-sets:-

a) To place on departmental computers the payroll and a minimum specified personnel record for those not at present on a computer payroll (approx. 50,000 staff).

b) Extend existing payroll computer systems to provide the minimum specified personnel record - and to satisfy standard payroll requirements. (It was noted that approximately 450,000 staff were already on various - and different - payroll computer systems).

c) Reduce as far as possible the number of computer installations on pay and personnel work.

d) Maintain on a new central computer a data-base of personnel information in respect of all staff, built up and updated by transfer of data from the departmental payroll computers (see (b) above); (the central computer to be capable of enhancement to meet Phase II requirements).

e) Integrate the CMSR into the central computer.

f) Provide an interrogation system for the central data-base so that processed information in its most useful form is available to central management points on demand.

It was hinted in paragraph 1.2 that one of the major deficiencies of the pre-Phase I system of pay and personnel systems was one of fragmentation and differing degrees of up-to-dateness and accuracy. As with most such systems - especially where centralised information is required from them - there are limitations and handicaps which inhibit the realisation of the objectives of the system; to wit: the need for more precise, detailed, accurate and readily accessible information about both jobs and people, so that the fundamental process of providing and matching people to posts, both in the individual sense (personnel management) and the overall sense (manpower planning) can be performed more effectively.

The handicaps and limitations usually lead to the following deficiencies :-

a) Lack of complete composite information in any one location.

b) The need to call for a number of partial records in order to make decisions and selections (both individually and in aggregate).

c) Delay.

d) Supply of incorrect information.

e) Clerical inefficiencies.

f) Discrepancies (i.e. mis-match) when more than one record is used to derive information.

Central to the conclusions and recommendations of the PRISM study are two-fold :-

1. The fact that a computer can :-

a) Store vast quantities of information in a very small space.

b) Provide rapid access to any individual item of that information.

c) Update or process individual (or collective) items of information at extremely high speeds.

d) Produce selected information in any desired format.

e) Automatically take appropriate action relating to the information in pre-determined situations.

2. The desire, and ability, to exploit these characteristics in a personnel sense would then seem to go a long way in eliminating - or at least reduce in a significant way - the deficiencies and handicaps noted above.

These considerations led to the notion that it is particularly important that payroll records should be included, since not only do these provide several basic items of personnel information, but also the nature of payroll work - requiring accuracy and processing at frequent and regular intervals - provides a sound, disciplined basis for accurate personnel records. From these notions, so evolved the philosphies underlying PRISM.

Discussion of PRISM Phase I can perhaps be accomplished in three ways :-

1) The hardware and interface between people and the hardware; and,

2) The record and file itself.

e) Applications.

Hardware

The recommendation contained in the feasibility report (taking into account the known growth and changes of computer configurations of computers in the Civil Service) was for a central computer whose main task would be the maintenance of a central data bank of personnel information for all non-industrial staff, kept up to date with information from the individual departmental computers. This was put forward as being more practicable than a completely centralised system (shown diagramatically in Appendix II) although the latter offered certain theoretical advantages and was recommended as a long-term aim. The central computer would be the source for central authority needs (e.g. the Civil Service Department).

The concept of such a network system is best described as a 2 level approach to data storage and information retrieval. That is to say, each department will maintain its own system and provide only certain standard bits of data to the centre to meet central needs. In the situation where a department does not have its own computer, it would use another's on an Agency basis.

The advantage of a network system (shown diagramatically as Appendix III) is that it enables extensive use of existing resources and does not conflict with the basic objective of providing a data bank centrally for central needs. Another advantage of a network system is that as such user departments would have more control, and more importantly they could expand and adapt PRISM to meet domestic needs. Such expansion and adaptation would be conditional of course on the adoption of standards laid down by the centre.

Thus, the work during Phase I and into Phase II will be of a network system evolving slowly over time to centralisation, bearing in mind the planned evolution of hardware complexes within the Civil Service, i.e. the phased replacement and rationalisation of existing computers.

Communications

There must be communication between man and machine- there must be peripherals and methods of input and output. It has been appreciated in the planning of PRISM that this need can cause problems of two sorts. One is of dialogue and the other is of extraction.

Dialogue is used in the sense of the user requiring one-off or ad hoc information. In this sense the user is probably not so much interested in the stocks in the system, but rather what is happening now within these stocks - that is, the flow - or else to individuals within the stocks. Satisfaction of this need poses two problems:-

1) The interface between the computer and the terminal - of whatever kind; and

2) The ability to have quick access, which in turn affects file structure (of which more later) and hardware.

The problem of extraction is posed in the sense of pre-scheduled and pre-determined output of information, usually in aggregate and is of prime concern to the central user, e.g. the Civil Service Department and other departments, external agencies etc. In this sense the user is concerned very much with the stock, both now and in the past, as well as flows, especially in manpower planning. These needs affect also the interface between the computer and the terminal and what kind of input-output access is to be had, which in turn affects the file structure and hardware.

PRISM in concept has solved the apparent (actually more apparent than real) dilemma by developing a disc system; a secondary one of tapes; and a unique file structure. Primary input for the creation and updating of the central data-base will be in the form of magnetic tape, output from departmental computers (direct data links are envisaged later on). Other data will be input as required at the centre via paper tape or punched card readers. Data links and Visual Display Units with hard copy facilities will be provided to give management an on-line information service and a bureau-type service for program development, statistical and other mathematical calculations, model building, etc. Large volume output - initiated via the VDU's or at the central installation - will be provided for by traditional printers.

The Record

The design of the record for PRISM is influenced by the concept (retained from the existing system) that the responsibility for keeping the record up to date rests with the employing department. What is happening to build upon the strength of the system is that the record will no longer be single purpose, and will be standard.

As stated earlier, one of the objectives of PRISM Phase I is a limited personnel record integrated with an enhanced pay record on departmental computers. The specified sub-set of data passed to the central data bank contains about 80 pay and personnel items. These have now been specified to a large degree and work is well under way in agreeing and specifying the final content of the sub-set and designing coding structures.

Apart from personnel items peculiar to the U.K. Civil Service, plans are not for anything necessarily surprising in terms of record content. However, an interesting aspect of long-term proposals is that the record should provide for both personnel details and job details of a considerable degree of depth. Hence, if the proposals are approved, the record will provide the base for two systems - one about people, their characteristics and the work they do, and one system about jobs and the establishment or organisation they exist in. The job, or position, register by grade, job specification etc., will not be considered until Phase II, but some job-people codification problems are under study now.

The PRISM approach to the classification of data and design of codes is within the principle of use or compatibility (where possible) with international and national standards. But the prime requirement is to meet the needs of Civil Service users and, in practice, in view of the dearth of suitable outside standards, virtually the whole of the design task has fallen on the PRISM team.

In the Phase I record there will be a simple occupational classification of people by their existing grade titles and a limited number of broad specialisms - e.g. personnel management or management services work. For Phase II a much more detailed and comprehensive job classification system is envisaged, probably multi-axial, which will be used to describe both jobs and a person's experience in terms of jobs held. The system will be designed so that it can provide national statistics under the CODOT classification (the United Kingdom Department of Employment's Classification of Occupations and Directory of Occupational Titles). The PRISM qualification code structure is being designed to match national statistics as specified by the Department of

Education and Science and the Office of Population Censuses and Surveys. The U.K. Standard Industrial Classification is being used as the basis for describing a person's employment before entering or after leaving the Civil Service.

The thinking behind all the coding structures is similar to the U.S./NATO systematic data element approach that is predominately numeric. Broadly, the idea is to record data as basic elements which can be grouped to meet changing circumstances - rather than starting with grouped data which cannot be broken down and formed into new groupings. For similar reasons, codes are generally non-significant.

Another long-term aim in records keeping is to standardise input documents. This is not practicable to any great extent in the foreseeable future because of the differing requirements in the individual network departments. But certainly the aim in Phase I is to have all departments using single input documents for changes affecting both pay and personnel parts of the records.

It seems, the importance in terms of benefit to the reader of a case study is not so much the content ~~of a~~ record, but more the responsibilities for maintenance and the uses to which the data in the record are put. This is primarily because the definition of file content is very much the function of the needs of a particular organisation and one could not recommend an ideal content. The Civil Service Department has placed the primary responsibility for maintenance of the records within departments upon the direct employer of the Civil Servant - that is, his own department. This is not only because it will be some years (Phase II or beyond) before it is envisaged that departmental manual records for day-to-day decision-making will disappear, but also, both in the long and short-term, the responsibility for accuracy must rest with the prime source of knowledge of the item or change in the item, i.e. the employing departments or employees themselves.

Also, in the end the department head will be the prime user of the system. He must have faith in the value of it. If he is responsible to a significant degree for its timeliness and accuracy, decisions made on insufficient or inaccurate information, then a significant portion of the failure of systems rests with him.

There is no immediate plans for the computer system to supplant completely all types of manual records - obviously, departments will always retain confidential assessments, private correspondence, etc. In any event - apart from desirability - it seems rather a formidable task with questionable value to code and record such data.

The File

The value of PRISM as a case study is perhaps twofold. One: it is unique in the sense of its comprehensiveness as a tool for personnel management in the public sector; and two: the uniqueness of the concept of the file structure for the central data-base. We shall concentrate on the latter in as much as we are concentrating on the former by presenting the case study.

It will be remembered that PRISM is an attempt to provide both dialogue and extraction. Thus the emphasis on file structure has - and must be - on retrieval of both sorts. To some extent the direction of thinking on the file structure was influenced by experience of CMSR. That is to say, you can never predict what people will want from a system or predict what use they will make with the information once obtained. To the designer and programmer this presents almost insoluble problems.

As the name (Personnel Record Information System for Management) implies, the main consideration is to provide an Information System. In this context it is worthwhile to - in the words of the PRISM File Structure Report - make the distinction between data and information. Data are the passive elements of a system: their use is information. By definition, PRISM must and will provide information, but it needs a data base to operate upon. Phase I PRISM has as its data only limited personnel records plus operational payroll data.

The main aims of the PRISM central file design are as follows :-

1) To provide the most efficient means of producing information within the constraints of firstly, hardware costs and secondly, the user requirements.

2) To retain flexibility within the system so that files may be expanded, amended and re-organised where necessary to meet a developing demand and the effects of changes in policy.

3) To provide, ultimately, a source of information which authorised users can access on demand without the intervention of programmers.

Thus the main problem was to accommodate insofar as possible user ad hoc demands without costly serial searches - or expensive programmer intervention in many cases. These inhibiting factors were overcome by the development of three disc-based files - each different in concept. The files are called "PRISMASTER" and "PRISMATIC" and "COUNTFLOW", and we shall now discuss each of these.

PRISMASTER

As the name implies, the PRISM Master Personnel file is made up of the individual personal records.

PRISMATIC

Is a small file whose function is to equate the National Insurance Number to a PRISM unique identifying feature called PIF (more of which later).

COUNTFLOW

Is a large file which, put in its simplest terms, contains sets of PIFS (remembering a PIF is a unique identifier of each Civil Servant) - each set comprising the PIFS of all Civil Servants having the attribute of one of the values of a PRISM element (e.g. a characteristic such as BSc; Year of Birth 1926; Grade X etc.) Thus, COUNTFLOW is an inversion of the conventional PRISM personnel record.

By identifying the population having the attribute represented by the code (e.g. all Grade X's are identified on one record), a direct link is established between the user and the data, enabling extraction of information. This eliminates serial searches and interrogation of many individual records. Obviously, the only thing the user cannot access from COUNTFLOW is the PRISM personnel record of an individual; thus necessitating the PRISMASTER file as described above. It is probably helpful if the structures and relationships between the main design elements of COUNTFLOW, PRISMASTER, PRISMATIC and PRISMASTER III (like PRISMASTER but containing leavers records) are illustrated as Figure 1.

It can therefore be seen that each of the files are interdependent and the nature and complexity of the information required will determine whether or not COUNTFLOW or PRISMASTER would be used. COUNTFLOW thus has an expensive, large trade off, break-even point. Essentially if tables are required - how many or how much? - COUNTFLOW will provide the answer without serial search. This is a broad generalisation, but is probably sufficient for this study. Additionally, COUNTFLOW will be used to identify PRISMASTER records for select listing. Appendix V shows how access is made to the files to answer various types of questions, and Appendices IV - VII depict this in diagrammatic form.

Access to the files will probably be by a high level enquiry language using the algebra of sets to link requests with the data by use of the connectors AND, OR and NOT. For example:-

> All employees in Grade X or Y born in 1930 or later, except those in Department Z, can be expressed: GRADE (X OR Y) AND YEAR OF BIRTH 1929 NOT DEPARTMENT Z.

COUNTFLOW can then be accessed to yield directly all the sets of PIFs, with the presence or absence of the desired attributes which can be processed immediately to give a new set of PIFs, meeting the required combined

FIGURE 1

BASIC DESIGN FEATURES

POSSIBLE LONG TERM DEVELOPMENTS - TWIN DATA-BANKS: PEOPLE & JOBS

EMPLOYEE DATA BANK

INDIVIDUAL CHARACTERISTICS
INDIVIDUAL PAY DETAILS
POST OCCUPIED →
HISTORY / DATING
(PLUS LEAVERS FILE)

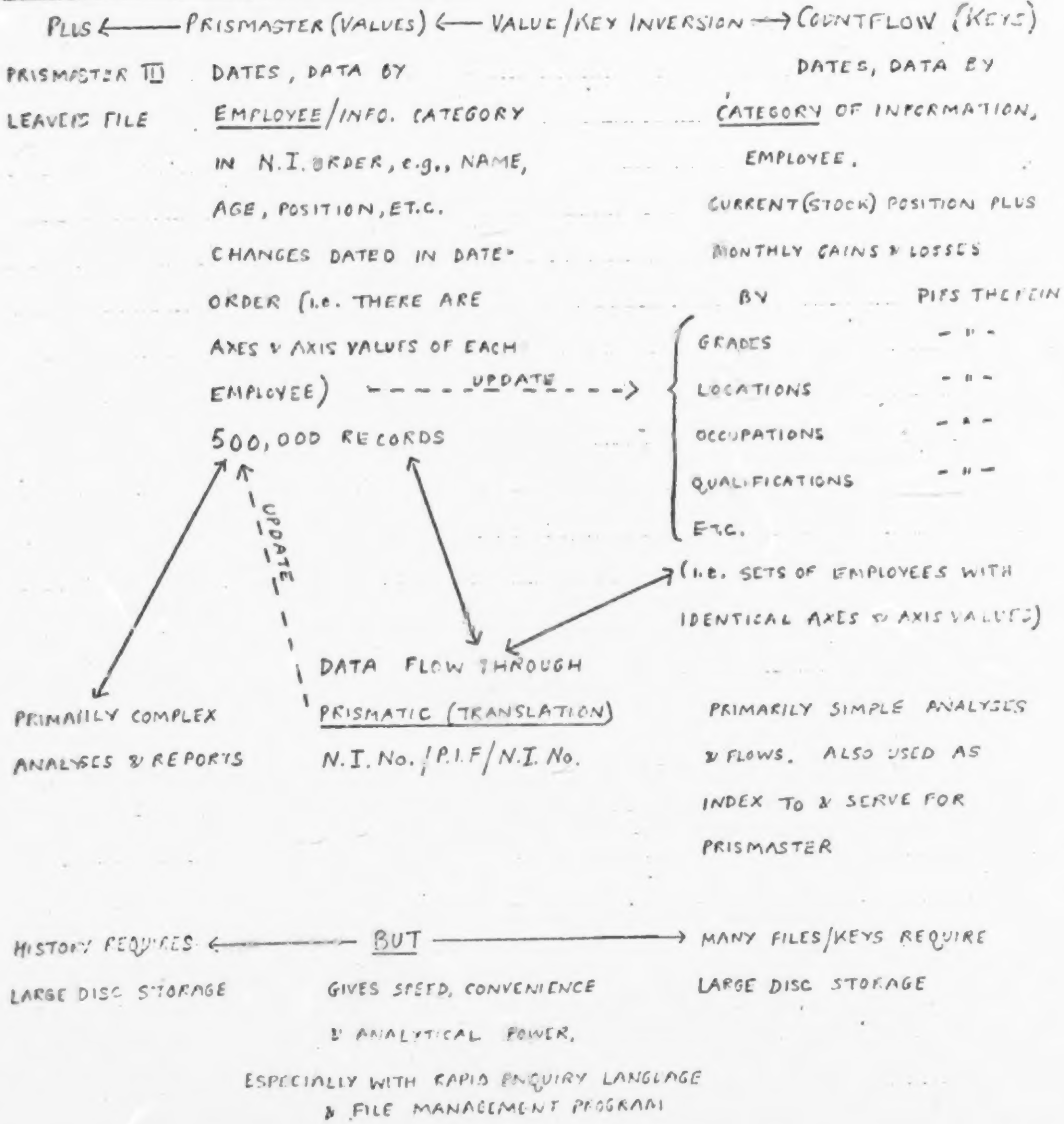
POST DATA BANK

CLASSIFIED & CODED BY:
JOB ANALYSIS ELEMENTS
JOB SPECIFICATION ELEMENTS
JOB EVALUATION ELEMENTS

BACK-UP DATA

PERSONAL FILE
STANDARD CONDITIONS
DEPARTMENTAL
DIARIES/FILES, ETC.
ETC.

PHASE I - CENTRAL FILE STRUCTURE



PLUS ← PRISMASTER (VALUES) ← VALUE/KEY INVERSION → COUNTFLOW (KEYS)

PRISMASTER III
LEAVERS FILE

DATES, DATA BY EMPLOYEE/INFO. CATEGORY IN N.I. ORDER, e.g., NAME, AGE, POSITION, ETC. CHANGES DATED IN DATE-ORDER (i.e. THERE ARE AXES & AXIS VALUES OF EACH EMPLOYEE) - - - - UPDATE - - - - →

500,000 RECORDS

DATES, DATA BY CATEGORY OF INFORMATION, EMPLOYEE.
CURRENT (STOCK) POSITION PLUS MONTHLY GAINS & LOSSES

BY ... PIFS THEREIN
- GRADES - " -
- LOCATIONS - " -
- OCCUPATIONS - " -
- QUALIFICATIONS - " -
- ETC.

(i.e. SETS OF EMPLOYEES WITH IDENTICAL AXES & AXIS VALUES)

UPDATE

DATA FLOW THROUGH
PRISMATIC (TRANSLATION)
N.I. No./P.I.F/N.I. No.

PRIMARILY COMPLEX ANALYSES & REPORTS

PRIMARILY SIMPLE ANALYSES & FLOWS. ALSO USED AS INDEX TO & SERVE FOR PRISMASTER

HISTORY REQUIRES LARGE DISC STORAGE ← BUT → MANY FILES/KEYS REQUIRE LARGE DISC STORAGE

GIVES SPEED, CONVENIENCE & ANALYTICAL POWER,

ESPECIALLY WITH RAPID ENQUIRY LANGUAGE & FILE MANAGEMENT PROGRAM

NOTES
N.I. No. = NATIONAL INSURANCE NUMBER
P.I.F = "PRISM" IDENTIFYING FEATURE (PERSONAL IDENTITY NUMBER WITHIN THE COMPUTER SYSTEM)

conditions. It should be noted that, as the header in COUNTFLOW for each element value set indicates the number of PIFs in that set, a count of all Civil Servants satisfying the enquiry can be obtained immediately from the results of processing the individual sets.

The need for PRISMATIC is solely on the need for economy of space. The National Insurance Number is the employee identifier and would occupy 2-24 bit words; whereas the PIF generated by PRISMATIC is 1-24 bit word. This is crucial when considering the potential size of COUNTFLOW. COUNTFLOW is updated and reorganised as a result of updating PRISMASTER.

Both PRISMASTER and COUNTFLOW in structure are highly flexible with the capacity and ability to add elements or groups in light of changing circumstances. Thus, not only can new data be added (e.g. a new qualification gained), but also, if a change occurs to an element - e.g. department and salary - the previous data is not lost. COUNTFLOW sets contain both current PIFs and past changes (as monthly gains and losses). In this fashion it will be possible to reconstruct the files at any given point in time.

The description of PRISMASTER and COUNTFLOW is of necessity brief and an attempt has been made to describe them in terms understandable to the non-computer specialist. The PRISM team will, we understand, be willing to discuss file structures in greater technical detail if approached. We see COUNTFLOW as a dynamic effort in overcoming the crucial problem in personnel information systems: namely rapid retrieval on two levels without laborious programmer intervention for ad hoc queries.

Updating the file and Phase I experience

It is envisioned that update will be weekly or more frequently for the personnel PRISM elements, but in the early stages some departments may be unable to update some of the payroll based elements more frequently than monthly; for example, where data cannot be validated until a final monthly payroll processing run. This is not, however, seen as an inhibiting factor because of the date sensitive nature of the files and the facility to derive information relating to past dates.

The CMSR, as previously stated, is providing useful experience for PRISM in regard to the retrieval of information, and experience with PRISMASTER and COUNTFLOW will, to a large degree, determine if any fundamental changes are required in PRISM Phase II. Appendix VIII is a functional Bar Chart which shows broadly how Phase I is to be implemented in the network departments.

Applications

Remembering the Civil Service Department is now charged with the responsibility of committing more resources to the career management of all Civil Servants, the main applications, especially during Phase I, will be working towards the efficient discharge of that responsibility.

The system is designed to provide management - both centrally (mainly the Civil Service Department) - and in departments, with information to assist in decision-making about training, development (both individually and in aggregate), promotion, transfer, etc. and to provide the necessary statistical support to enable planning of all sorts - not the least manpower planning. PRISM aims to satisfy these sorts of applications by providing information that is refined (i.e. only what is needed), reliable and prompt Not all these aims will be met fully by Phase I, which has only a limited personnel record except for the CMSR population, for whom some additional information, mainly on job experience and training, is recorded.

We have stated that central to PRISM, PRISMASTER and COUNTFLOW is the notion that management cannot say what it wants until the problem arises - hence the file structure. However, the bulk of applications (apart from specialised statistical/mathematical applications) are currently viewed to be regular, frequently recurring tables and returns. To date, provision is being made for over 100 standard output tables from the central installation (this also supports the notion that an efficient management can make many of the decisions arising from day-to-day from such reports and tables). This number is not as formidable as it sounds when one realises that PRISM is planned to provide an information service about 500,000 Civil Servants in over 100 departments, who have characteristics and needs, some of which are common, some of which are individualistic in a departmental sense. However, when PRISM is operational, and management has the facility to conduct enquiries through remote terminals by question and answer, it is anticipated that the volume of regular printed output will be considerably reduced.

The main users of the central PRISM service will be the various Divisions in the Civil Service Department, particularly Statistics Divisions, who are currently developing new methods to handle data and encouraging the better use of it, especially for forecasting manpower requirements. This implies model building.

PRISM will allow a fuller exploitation of statistical tools, e.g. the study of different groups of people: factual reviews of stocks and flows; supply forecasting (using assumptions on wastage); strategies to fill perceived needs - that is recruitment policies, optimum age/qualification distributions, etc.

PRISM will also contribute (albeit to a limited extent in the Phase I system) to efficient personnel management by assisting, for example, the preliminary processes of selecting staffs for posts, providing a better match between qualifications, experience, performance, potential, career pattern, wishes of the individual and the requirements of the job; planning transfers and training; and developing careers.

In the field of manpower planning, the capacity for processing information should permit better forecasting of wastage and intake and more sophisticated manpower model building.

2.4 Phase II (1975-1980)

The objectives of Phase II are :-

1) To review the items of personnel information required at the centre in the light of management needs and to arrange for them to be included in the central data-base;

2) to reduce still further the number of departmental computers handling pay and personnel records, concentrating the work as far as possible in a few installations specialising in this work;

3) to co-operate with departments in extending the departmental computer data-bases to include virtually all the personnel management and manpower planning information needed by departments, as economically as possible;

4) to develop the telecommunication system of the PRISM network and to increase the provision of remote terminals so that personnel information is more immediately available to managers in departments.

During this Phase, apart from extending the personnel record to make it fully comprehensive, further records will be developed, such as recording the characteristics and qualifications required for each post, thus completing the matching of jobs and people. PRISM Phase I is primarily concerned with records recording the characteristics of people - not jobs. To a large extent, development in Phase II will be a direct reflection of experience gained in Phase I. It is planned that by the end of Phase I all the departmental computer payroll systems will provide certain standard facilities. Payroll development in Phase II will be mainly directed to increasing standardisation in detailed systems design and programming.

It must also be remembered that during the course of Phase I, much of the preliminary planning work, towards agreeing the form of the fully extended personnel record and coding frames for Phase II will have been started so that such developments may proceed smoothly and with minimal disruption, bearing in mind that file conversion in the network computers will be the responsibility of the departments concerned.

Much of the implementation of Phase II as foreseen now will, of course, largely depend upon whether existing plans for hardware development are realised in the context of the changing patterns of work and organisation within the Civil Service. Although current plans are for a network system evolving towards a central system, alteration to current schedules of hardware rationalisation, linked with changes in departmental functions, will affect this sort of transition.

Thus, in general terms, Phase II is seen to be a period of:-

1) consolidation of Phase I progress and further development of personnel records;
2) increasing standardisation of records, procedures and software;
3) further development of special programmes for processing data; and
4) improvements in telecommunication facilities, with extensive provision of remote terminals.

This in summary can be described as a rational step by step approach to the total integration of a comprehensive centralised system, with no artificial inhibitions to change.

It is significant to note that to date there has been no slippage in the time scale of Phase I and thus the pre-planning for implementation of Phase II has not been changed in a fundamental way. This is not to say that the Project Team is not continually assessing and amending and improving. Full authority to proceed with Phase II as set up will not be granted pending a review of planned developments, which will take account of experience gained during the setting up of the Phase I system. The review will probably take place in 1972/73 so that authority can be sought in time to ensure continuity of planning.

III. OBSERVATIONS AND CONCLUSIONS

3.1 Observations

Firstly, we would certainly wish to express our deep gratitude to all the members of the PRISM Project Team for their willingness during the interviews to answer many questions - sometimes over and over again. The time given to us during the interviews is also appreciated as is the wealth of detail given us to sift through in presenting this case. We have had to be selective in presenting what we feel will be informative and educative for managements interested in this area of activity. Should any reader wish to explore the matter in greater detail - either conceptually or technically - we are sure that members of the Project Team will accord them the same hospitality as shown us. We would especially like to thank Messrs. C.P. Marks and L.J. Jenkins, without whose co-operation and enthusiasm for the study, this case quite likely would not have proceeded at all. We also thank them for their endless patience for this study to materialise after such a long delay.

It seems that there are several lessons to be learned from the Civil Service Department's experience in the area of computer-based personnel information systems. The primary one is that the Civil Service Department is in fact aiming (and from the evidence available will succeeed) at an information system, not merely computerised personnel records - a term which should be eschewed in any case. This is fundamental in that managers and managements must be precise in what they want the system to do, even though they cannot specify precisely in advance the information they want out, and if computer applications in personnel management are to mean anything and not lose credibility, they must be more than record keeping devices. The point being here that the Civil Service Department did not set out to mechanise extant records, but conceptualised a system in terms of its functions, its inputs, its likely outputs - then proceeded to structure a record, the PRISM record, to meet the requirements of the system, not the other way round. This, in essence, means that, when fully operational, PRISM will contribute to the more efficient management of the Civil Service and not just record the numbers therein.

The second lesson is one of pace and study in feasibility terms (another term that smacks too much of what it is not. With computer hardware and software technology being in the advanced state that it is, most concepts are feasible in a technical sense - therefore what the study must determine is the practicability of the concept in terms of resources and priorities allocated to it). Some readers will say - but, ah ha! - the Civil Service Department is aiming at a system encompassing 500,000 people in widely dispersed locations some of which already have computing capability, so they must go slow (10 years to full Phase II) and spend time and money in presenting the case to proceed (10 people for 9 to 12 months), surely this has no relevance to my profit oriented company with 5 or 10 thousand employees. We submit that this argument has no validity. The success or not of any system depends very much upon two things:-

1) Positive commitment from the top to the concept and the consequent release of necessary resources to do the job.

2) The time and detail of the study in terms of defining what is desired from the system and why; and the resulting pragmatic step by step approach to implementation.

What we are saying is quite simply this: if an organisation is contemplating this sort of activity, it must be prepared to define objectives, commit the necessary resources, and proceed with caution. If not, then the eventual system quite likely will not meet perceived expectations. Vital also to this concept and the two conditions noted above, is the necessity to compare existing systems and procedures with the new in real situations - that is parallel running. Because of the time scale of PRISM this will be accomplished in an effective way. This is because what is being done now manually in the management of human resources will not cease and wait for Phase II.

The third lesson from the study is the necessity for dialogue with users of information and suppliers of data. We have not discussed this facet of the PRISM feasibility study earlier but the lesson from their approach is worthy of comment. The Project Team not only carried out extensive investigations into the existing methods and procedures in departments, but also attempted to find out what they thought they wanted from an enhanced system (these wants must be rationalised into needs). The point is, that with the best will in the world any system conceived in isolation by computer technicians is not likely to meet the expectations of those who request it. Further, extensive study was made of other users - mainly in the Civil Service Department itself - in its role of having an overview of civil service personnel management and responsibility for manpower planning.

The Project Team talked to industries and public agencies both in the U.K. and abroad to gain insight into the current thinking of people and organisations who already had experience in this area. The benefit of this activity is often undervalued in that hard experiences, both successful and unsuccessful, are bound to enhance the collective knowledge in this area.

We would also like to comment upon the fact that the Project Team is multi-disciplined. This in our view is vital. In smaller organisations the practical lesson is that the team must at least be a personnel man and a computer man full time. Deficiencies of design are likely to occur if these applications are given the part-time effort of a systems man and a programmer staying in their environment. They should be seconded to the personnel department as a project team. (The same point emerges from the Esso study.)

The last lesson is perhaps one of disquiet on our part - not with the depth of the study of the Project Team, the systems they are working on, nor in the way in which they are working towards the objectives. This is commendable. What is disquieting is that so much of the effort need not have been necessary were there more public knowledge about advancements in this area, both in a conceptual and technical sense. Our experience shows that invariably each organisation has had to "do it yourself" and repeat laborious processes already gone through by others. This, in our view, is a deplorable state of affairs both nationally and internationally. It is true that there are some aspects of a system, especially in terms of file content not structure, that must be unique. Let us share more widely than is now the case the existing knowledge and development. This is especially true in the matter of design of coding.

3.2 Conclusions

Our conclusions are few and not complicated.

1) The management of human resources in any organisation can be enhanced only if there is a viable data-base on which to build and that such can be accomplished with good effect by using computing capability.

2) The effective use of computing capability ought not be based on the concept of merely mechanising existing record systems: this approach will never lead to an information system. Consideration should be given to integrating pay and personnel systems.

3) Objectives and resources must be set clearly and time tables agreed and worked to. Executive management must also be committed fully and sanction necessary resources.

4) Records (and as such input documents) and procedures must be structured to meet the demands of the system; not build a system around existing records.

Cmnd. 3638 — The Fulton Report

SUMMARY OF MAIN FINDINGS

1. The Home Civil Service today is still fundamentally the product of the nineteenth-century philosophy of the Northcote-Trevelyan Report. The problems it faces are those of the second half of the twentieth century. In spite of its many strengths, it is inadequate in six main respects for the most efficient discharge of the present and prospective responsibilities of government:—

(a) It is still too much based on the philosophy of the amateur (or "generalist" or "all-rounder"). This is most evident in the Administrative Class which holds the dominant position in the Service.
(b) The present system of classes in the Service (there are over 1400, each for the most part with its own separate pay and career structure) seriously impedes its work.
(c) Scientists, engineers and members of other specialist classes are frequently given neither the full responsibilities and opportunities nor the corresponding authority they ought to have.
(d) Too few civil servants are skilled managers.
(e) There is not enough contact between the Service and the community it is there to serve.
(f) Personnel management and career planning are inadequate.

For these and other defects the central management of the Service, the Treasury, must accept its share of responsibility.

2. We propose a simple guiding principle for the future. The Service must continuously review the tasks it is called on to perform; it should then think out what new skills and kinds of men are needed and how these men can be found, trained and deployed.

3. A new Civil Service Department should be set up with wider functions than those now performed by the "Pay and Management" group of the Treasury, which it should take over. The new department should also absorb the Civil Service Commission.

4. The new department should be under the control of the Prime Minister. We hope that he will retain direct responsibility for senior appointments, machinery of government and questions of security. Outside this area, we suggest that the Prime Minister should delegate day-to-day responsibility to a non-departmental Minister of appropriate seniority who is also a member of the Cabinet.

5. The Permanent Secretary of the Civil Service Department should be designated Head of the Home Civil Service.

6. All classes should be abolished and replaced by a single, unified grading structure covering all civil servants from top to bottom in the non-industrial part of the Service. The correct grading of each post should be determined by job evaluation.

7. The Service should develop greater professionalism both among specialists (e.g. scientists and engineers) and administrators (i.e. the new counterparts of the present Administrative and Executive Classes). For the former this means more training in management, and opportunities for greater responsibility and wider careers. For the latter it means enabling them to specialise in particular areas of government. We identify two such areas and accordingly recommend the development of a group of economic and financial administrators, and a second group of social administrators.

8. Employing departments should have a larger role in recruitment and there should be a speeding up of procedures. A majority of us consider that in the recruitment of graduates for one or other of the groups of administrators more account should be taken of the relevance of their university courses for the job they are being recruited to do.

9. A Civil Service College should be set up. It should provide major training courses in administration and management and a wide range of shorter courses. It should also have important research functions. The courses provided by the College should not be restricted to civil servants; a proportion of places should be set aside for men and women from private industrial and commercial firms, local government and public corporations.

10. More resources should be devoted to the career management of all civil servants. All must have the opportunity to progress as far as their talants and appropriate training can take them. This involves major changes in promotion procedures.

11. While the Civil Service should remain predominantly a career Service, there should be greater mobility between it and other employments. We, therefore, recommended an expanded late entry, temporary appointments for fixed periods, short-term interchanges of staff and freer movement out of the Service. These proposals involve substantial changes in the pension scheme and the replacement of "established" status by new terms of employment.

12. In the interests of efficiency, the principles of accountable management should be applied to the organisation of the work of departments. This means the clear allocation of responsibility and authority to accountable units with defined objectives. It also means a corresponding addition to the system of government accounting.

13. Management services units with highly qualified and experienced staff should be set up in all major departments.

14. Departments should establish Planning Units.

15. In addition to the Permanent Secretary, there should also be in most departments a Senior Policy Adviser to assist the Minister. The Senior Policy Adviser would normally be head of the Planning Unit. His prime job would be to look to and prepare for the future and to ensure that present policy decisions are taken with as full a recognition as possible of likely future developments.

16. In some of the big technical departments, there may be a need for a further job; a chief scientist, engineer or other specialist.

17. We do not propose that the Senior Policy Adviser and chief specialist, together with the Permanent Secretary, should constitute a formal board. The working arrangements should be informal and variable from department to department and from time to time; different Ministers' individual ways of working will do much to determine the pattern.

18. There should be one man who has overall responsibility under the Minister for all the affairs of the Department and he should continue to be the Permanent Secretary.

19. A Minister at the head of a department should be able to employ on a temporary basis such small numbers of experts as he personally considers he needs to help him.

20. We have suggested a number of further inquiries. Their subjects among others, should be:—

(a) the desirability of "hiving off" activities to non-departmental organisations;

(b) ways and means of getting rid of unnecessary secrecy both in policy-making and in administration;

(c) the new pattern of joint consultation that will be appropriate for the Civil Service in the light of the Government's decisions on our report. This inquiry should be conducted jointly by the Civil Service Department and the staff associations;

(d) methods of making recruitment procedures as speedy and objective as possible.

21. If our proposals are accepted, we hope that the Government will take steps to see that the progress made in their implementation is reviewed. This could be by an annual report to Parliament during the next five years. A small committee might be set up at the end of that period if needed.

22. We have seen that the Service has men and women with the ability, vision and enthusiasm needed to carry our proposals through to success. A Civil Service reconstructed on the basis of these proposals will, we believe, make possible the progressive and efficient conduct of our affairs.

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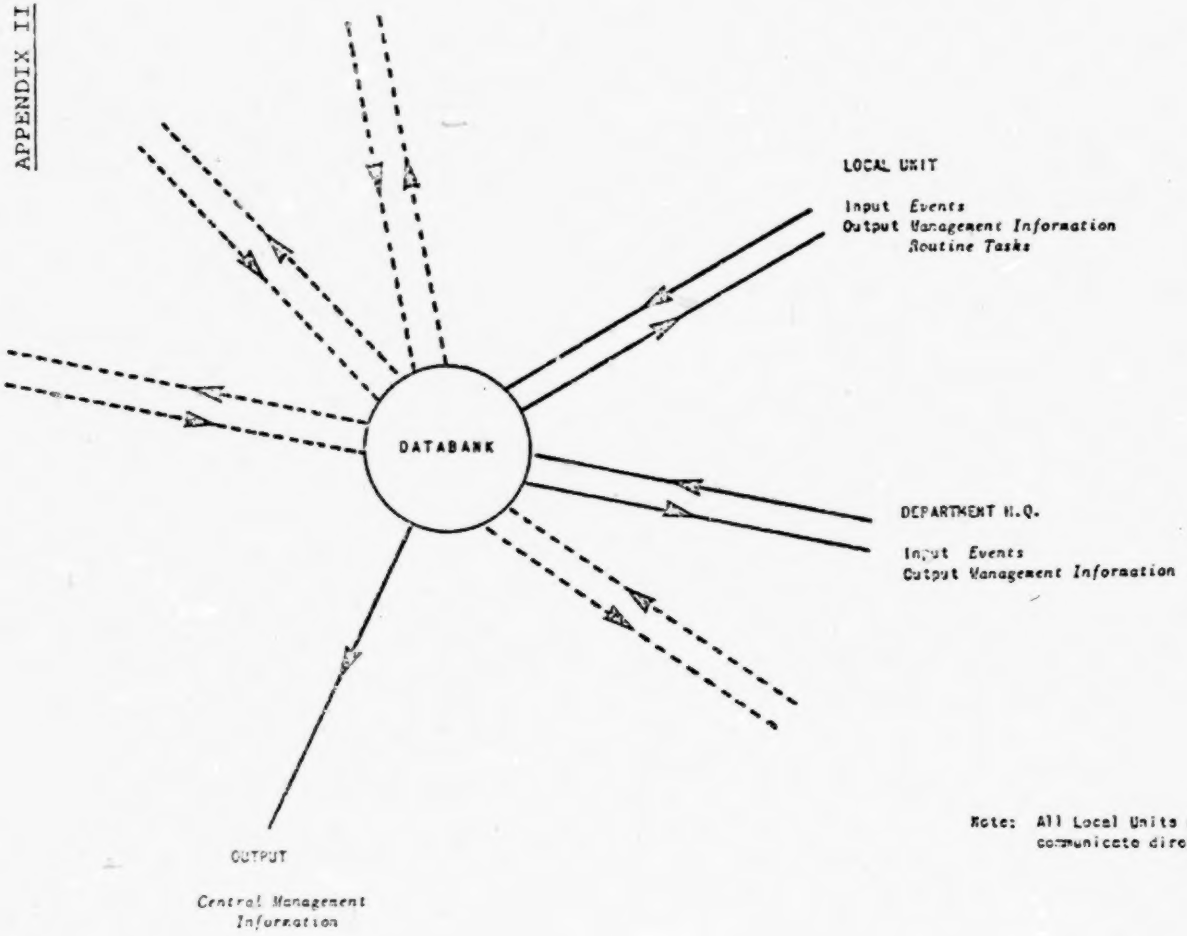
APPENDIX II

CIVIL SERVICE PERSONNEL INFORMATION SYSTEM

Schematic Diagram of Information Flow for Centralised System

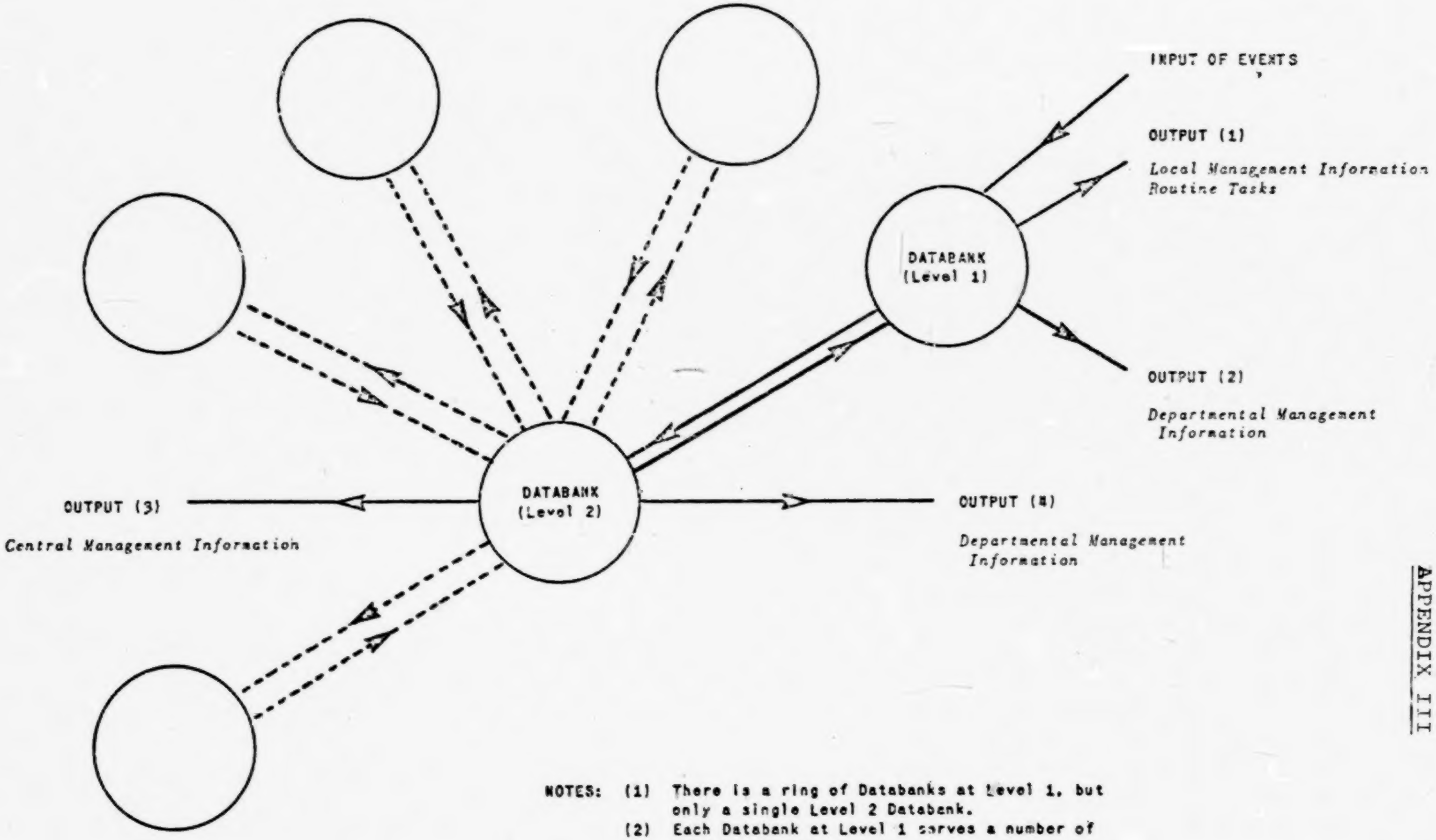

LOCAL UNIT
Input Events
Output Management Information
Routine Tasks
DATABANK
DEPARTMENT H.Q.
Input Events
Output Management Information
OUTPUT
Central Management Information

Note: All Local Units and all Department H.Q's communicate direct with the centre

APPENDIX III

CIVIL SERVICE PERSONNEL INFORMATION SYSTEM

Schematic Diagram of Information Flow for Network System


INPUT OF EVENTS
OUTPUT (1)
Local Management Information
Routine Tasks
DATABANK
(Level 1)
OUTPUT (2)
Departmental Management
Information
DATABANK
(Level 2)
OUTPUT (3)
Central Management Information
OUTPUT (4)
Departmental Management
Information

NOTES:
(1) There is a ring of Databanks at Level 1, but only a single Level 2 Databank.
(2) Each Databank at Level 1 serves a number of peripheral points.

APPENDIX IV

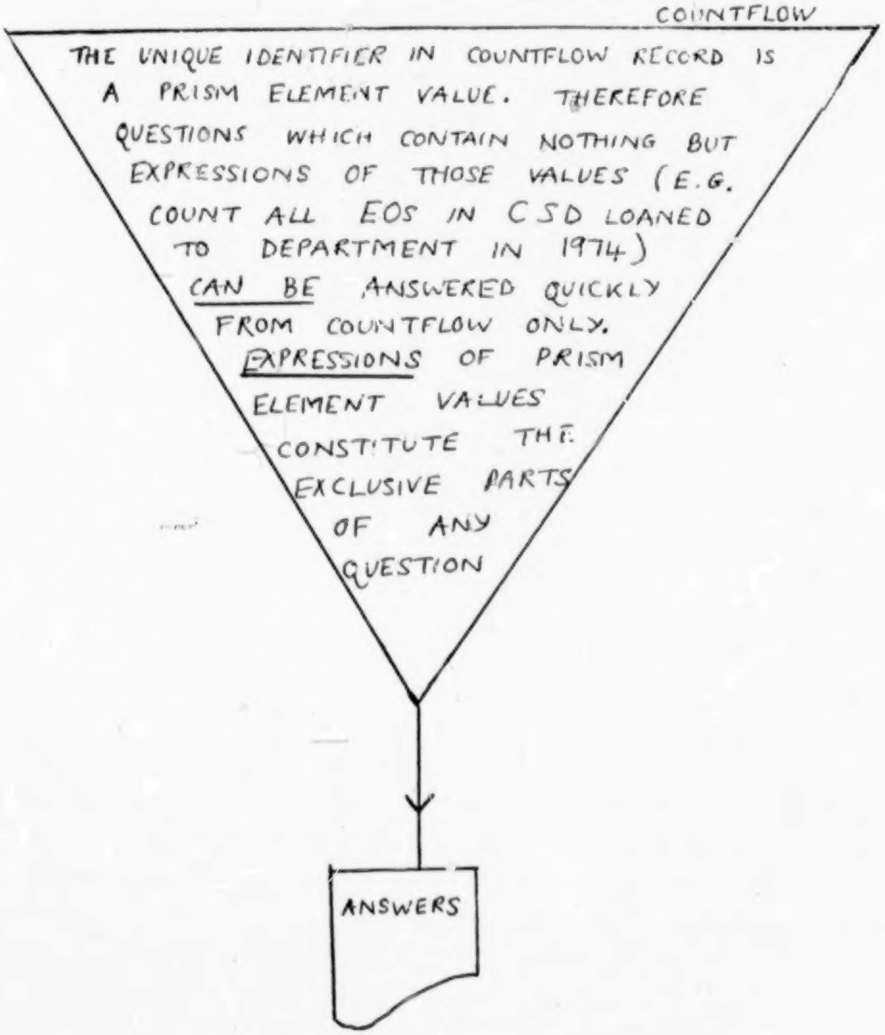
ANALYSIS OF QUESTION TYPES IN RELATION TO THE PRISM INFORMATION FILES

TYPE	DESCRIPTION	ANSWERED FROM
1. Personal Record Display or Print	A full or limited print of an individual's personal record	PRISMASTER only
2. Statistical-Count	A request for statistical extract, all expressions code exclusive and no more than a 1-way classification.	COUNTFLOW only
3. Statistical-Flow	As for count, but related to a given interval of time.	COUNTFLOW only
4. Analytical Count of Flow	A request for a report, expressions code-exclusive or partially code-exclusive and a more-than-one-way classification.	COUNTFLOW and PRISMASTER
5. Statistical Count or Flow with Nominal roll	As for types 2 & 3 but nominal roll is requested.	COUNTFLOW and PRISMASTER
6. Single-element Statistical	A request which contains only one code-exclusive expression eg count the number of female civil servants	The record count in the header of one COUNTFLOW record

APPENDIX V

COUNTFLOW THE SOLE SOURCE OF CERTAIN INFORMATION

ENQUIRY

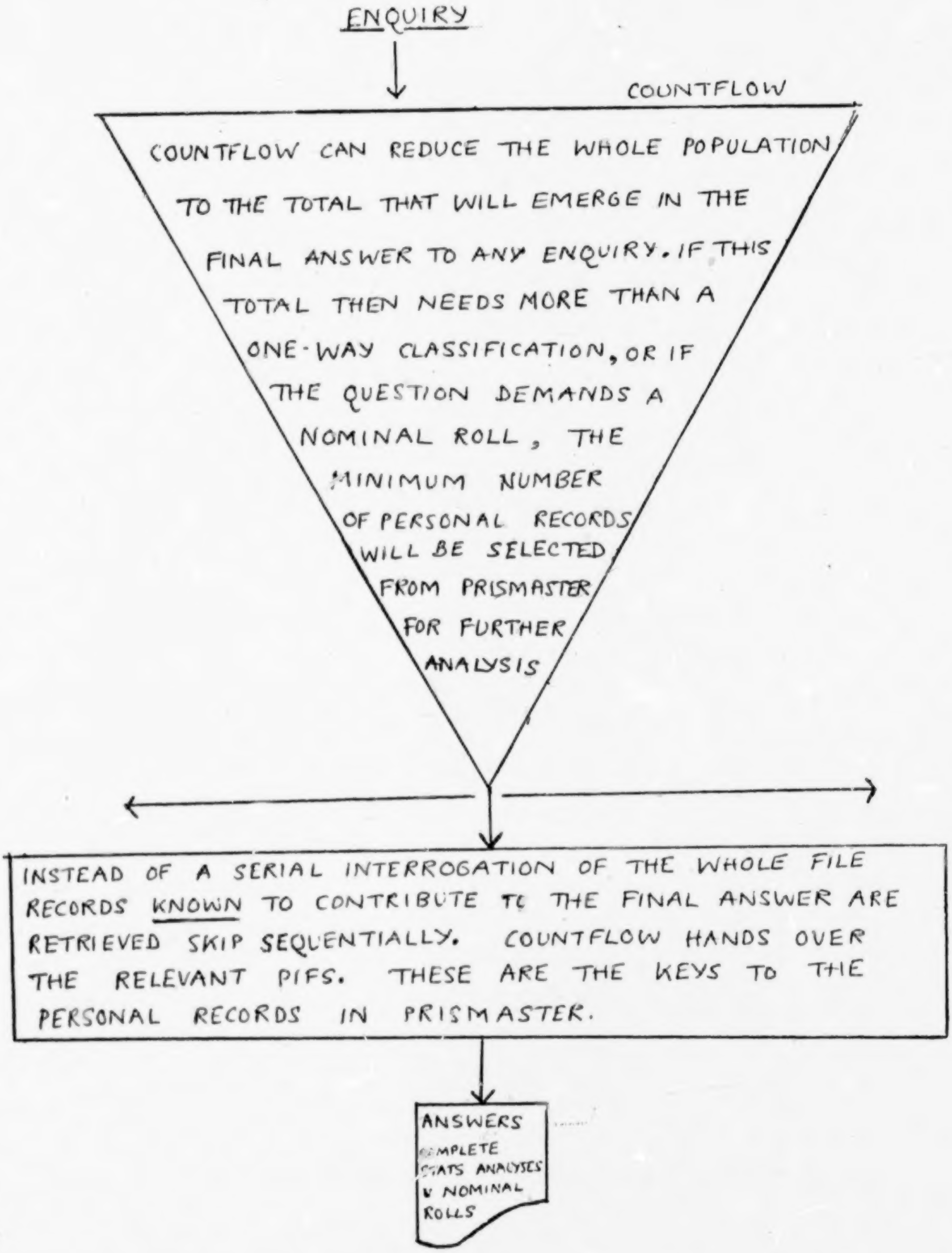


THE UNIQUE IDENTIFIER IN COUNTFLOW RECORD IS A PRISM ELEMENT VALUE. THEREFORE QUESTIONS WHICH CONTAIN NOTHING BUT EXPRESSIONS OF THOSE VALUES (E.G. COUNT ALL EOs IN CSD LOANED TO DEPARTMENT IN 1974) CAN BE ANSWERED QUICKLY FROM COUNTFLOW ONLY. EXPRESSIONS OF PRISM ELEMENT VALUES CONSTITUTE THE EXCLUSIVE PARTS OF ANY QUESTION

COUNTFLOW ANSWERS ALL QUESTIONS WHICH DO NOT DEMAND NOMINAL ROLLS OR EXTENSIVE ANALYSIS

IT DOES NOT PRODUCE PERSONAL RECORDS FOR DISPLAY

COUNTFLOW AS AN INDEX TO PRISMASTER



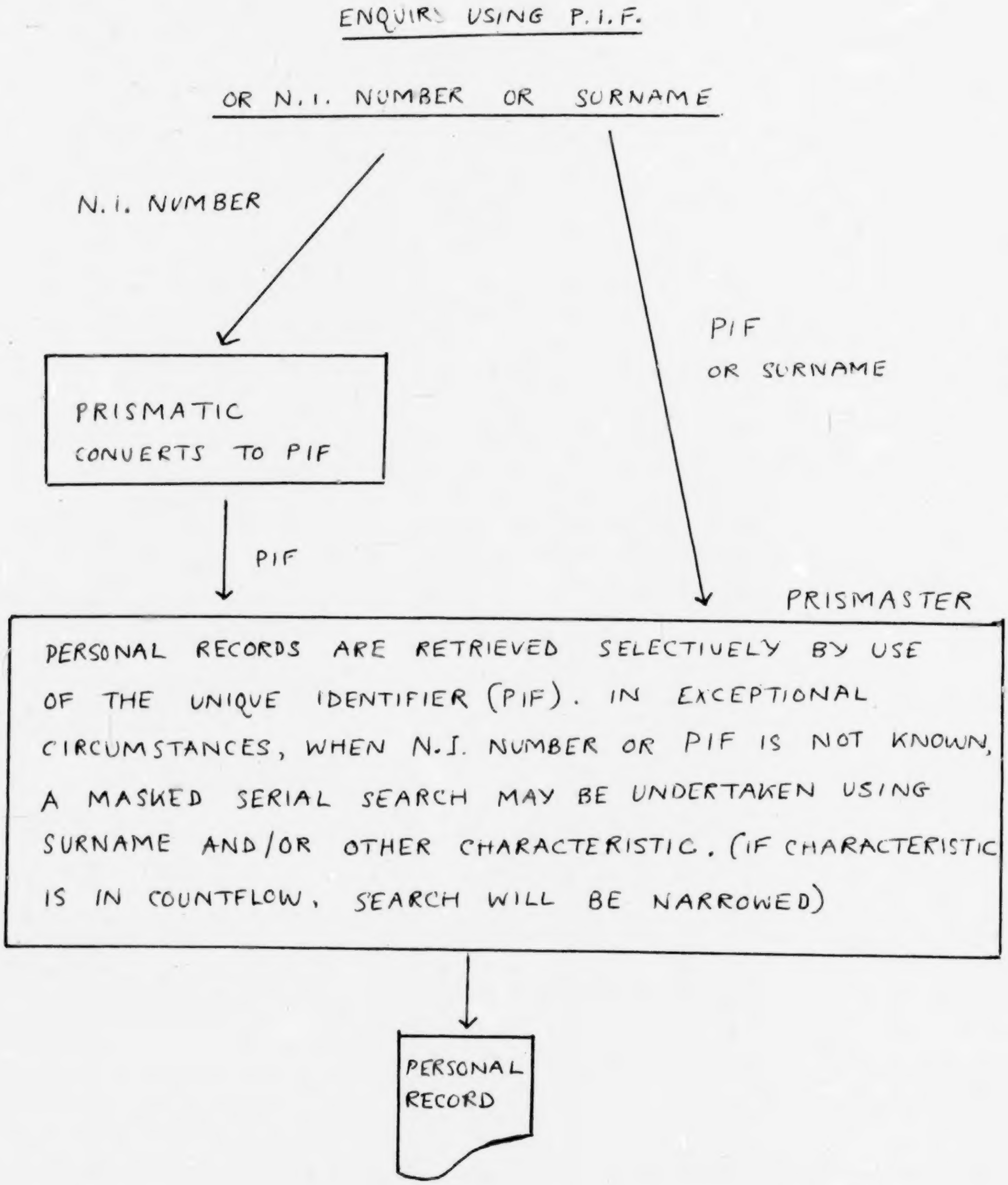
COUNTFLOW CAN REDUCE THE WHOLE POPULATION TO THE TOTAL THAT WILL EMERGE IN THE FINAL ANSWER TO ANY ENQUIRY. IF THIS TOTAL THEN NEEDS MORE THAN A ONE-WAY CLASSIFICATION, OR IF THE QUESTION DEMANDS A NOMINAL ROLL, THE MINIMUM NUMBER OF PERSONAL RECORDS WILL BE SELECTED FROM PRISMASTER FOR FURTHER ANALYSIS

INSTEAD OF A SERIAL INTERROGATION OF THE WHOLE FILE RECORDS KNOWN TO CONTRIBUTE TO THE FINAL ANSWER ARE RETRIEVED SKIP SEQUENTIALLY. COUNTFLOW HANDS OVER THE RELEVANT PIFS. THESE ARE THE KEYS TO THE PERSONAL RECORDS IN PRISMASTER.

COUNFLOW ACTS AS A SIEVE TO ELIMINATE RETRIEVAL AND INTERROGATION OF PERSONAL RECORDS WHICH DO NOT CONTRIBUTE TO THE INFORMATION ASKED FOR.

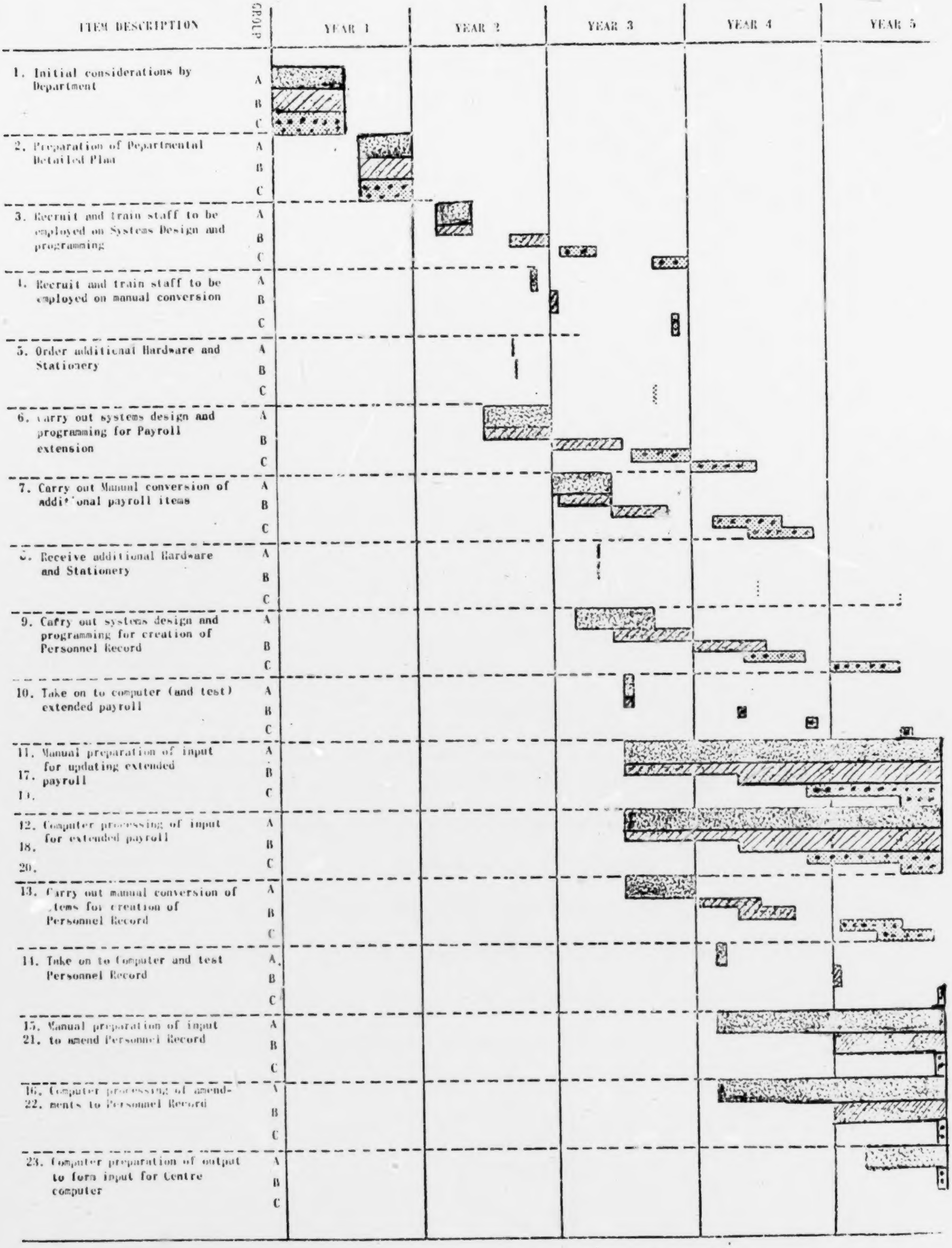
APPENDIX VII

PRISMASTER - THE SOLE SOURCE OF INDIVIDUAL PERSONAL RECORDS


ENQUIRY USING P.I.F.
OR N.I. NUMBER OR SURNAME
N.I. NUMBER
PIF
OR SURNAME
PRISMATIC
CONVERTS TO PIF
PIF
PRISMASTER
PERSONAL
RECORD

PERSONAL RECORDS ARE RETRIEVED SELECTIVELY BY USE OF THE UNIQUE IDENTIFIER (PIF). IN EXCEPTIONAL CIRCUMSTANCES, WHEN N.I. NUMBER OR PIF IS NOT KNOWN, A MASKED SERIAL SEARCH MAY BE UNDERTAKEN USING SURNAME AND/OR OTHER CHARACTERISTIC. (IF CHARACTERISTIC IS IN COUNTFLOW, SEARCH WILL BE NARROWED)

APPENDIX VIII



▩ Group A: Departments which are due to change computers in Year 1 or in Phase II

▨ Group B: " " " " " " " " Years 2 or 3

▦ Group C: " " " " " " " " Years 4 or 5

CHAPTER IV

AN ANALYSIS OF SOME STARTUP AND OPERATIONAL COSTS (Based on the U.K. Studies, but of general interest to all users).

BY: A. Hersleb

COSTS AND COST COMPARISONS

The Civil Service have developed for the PRISM project extremely thorough and sophisticated budgets and estimates for Phases I and II, covering the first 10 years, plus a cost lookahead up to year 18. These are analysed under the broad heads of Annual Expenditure and Savings, Net Return, Discount Factors, and Present Value (i.e. using a D.C.F. approach). The Annual Expenditure itself is broken down under the headings of Plant, Machinery and Equipment, Accommodation including air conditioning etc., Training Costs, Staff Costs, Stationery, Tapes and other supplies, Post Office charges, and Computer Running Costs. There is a formidable wealth of supporting documentation including work standards and other cost factors employed, and indeed the whole cost projection forms a substantial part of the original Feasibility Report Volume II - Appendices 1 - 64. This is a monumental example of painstaking planning, forecasting and estimating, but it is not easy to get to trips with. We therefore thought it would be helpful to attempt to summarise the cost position for this present study.

Since this is a government application the Civil Service Department's analyses present the cost of PRISM essentially as expenses paid for in annual increments from the continuing flow of national government revenue, e.g. the purchase price of a particular item of hardware appears as a once-off expense in a particular year. In presenting this very broad summary of the complicated figures in the Feasibility Report we felt it appropriate for the purposes and readership of this study to re-arrange them into the more familiar pattern of "capital" expenditure (once-off purchase of hardware and stocks), of "start-up" costs (essentially non-recurrent expenditures on e.g. programming, training, data conversion, initial input, validation, etc.) and of "operating" costs (on-going running and maintenance costs of the system, supplies, replacements, rentals, accommodation overheads and amortisation, utilities, salaries, communication costs, etc.)

We have tabulated the accumulated costs on this basis for the first 5,10 and 18 years. We have then picked-out the annual operating costs for three individual years representing stages of development - the 5th, 10th and 15th year.

We wish to make it clear that the resulting figures are our own interpretation and digestion in these terms of the very detailed and complex year-by-year estimates of the C.S.D. The latter are in no way responsible for any errors or misinterpretations that may have occurred. These are distinctly possible; for example we have necessarily had to be somewhat cavalier in deciding whether a given item in a certain year is more properly to be attributed to "start-up" or to "operating costs". Nevertheless, we trust, notwithstanding some few of these judgements of Solomon, that the results may be a useful if approximate picture of the estimates for PRISM in terms of capital, start-up and operating costs are given, and as such they may give some guidance to others embarking upon equally ambitious and sizeable projects.

The detailed realities underlying the PRISM cost analysis are complex in that most of the payroll aspects of the overall PRISM system are in fact already in being in a computerised form at various payroll centres within the Civil Service while others are going forward under plans developed prior to PRISM. These will be integrated into PRISM but their costs already incurred are excluded from the analysis; to a much smaller extent this would apply as well to any existing personnel aspects taken into PRISM. The latter's costs are thus incremental to these and therefore essentially concerned with the development of PRISM in its personnel phase. However, they include any incremental costs of payroll additions and integration, though these are proportionately small. On the other hand the PRISM programme assumes the incorporation of The Ministry of Defences' domestic personnel system; already well advanced in terms of development and expenditure and forming a not inconsiderable proportion of the half-million records in the divisor. These latter costs are again excluded for incremental costing purposes and to that extent the analysis could be said to understate the total costs of the Personnel phase of PRISM. However, for present broad purposes it may justifiably be assumed that these payroll inclusions and Defence exclusions more or less cancel each other out. Thus the figures as presented give a reasonable estimate of the costs of developing and operating a very large and sophisticated manpower information system in its personnel phase.

The resulting figures when viewed on a per-capita basis demonstrated a remarkable economy and we decided therefore to cross-check the costs of other systems. Several organisations have in consequence kindly supplied us with information at some inconvenience to themselves. We originally considered tabulating these data on a per-capita basis for comparison. We quickly discarded this notion, for reasons which follow, and now append the details we have obtained in brief descriptive form in the hope that they may be of some interest and value to other system users or potential users.

It is in fact impossible to make an accurate or meaningful and fair cost-comparison between separate systems without the closest investigation of each. This would involve a series of penetrating case studies conducted within an elaborate framework of methodology and agreed accounting conventions far transcending our present resources and terms of reference. Among the difficulties of equating one system with another in cost or efficiency terms are :-

1. The overheads and per-capita costs of a non-integrated personnel system are likely to be higher than for an integrated pay-personnel-pensions system. In the latter it is frequently not easy to separate the costs of these component applications.

2. Payroll costs vary inter alia with the complexity of the compensation system, the background legal, fiscal and social security requirements, and the ratio of weekly to monthly payments. Some payrolls include administration and payment of pensions etc. Some deal with substantial proportions of expatriates whose compensation may be complex. Thus the true divisor (number of records) for the payroll phase of an integrated system may differ from the pension and personnel phases; this further complicates inter-system comparisons. (We found it difficult to obtain any information about payroll costs from most of our informants in the time available).

3. Domestic accounting systems vary widely in their conventions, methodology and scope. Costs of systems reported and borne by Personnel Departments may vary accordingly. There appear to be widely different approaches to the computation of overheads on salaries, the allocation of accommodation and related costs, and the charging of machine and programming time, etc.

4. There is clearly a non-linear relationship between costs and record-populations, i.e. economy of scale operates. However, the degree of non-linearity may vary as between capital, start-up and operating costs and as between payroll and personnel applications and requirements.

5. The inter-related consequences of user requirements and system design may powerfully influence costs in other ways, too :-

    a) Instant individual information is expensive (e.g. in systems emphasising management development/career planning; in those dispensing entirely with individual manual records; in rapid deployment of men to tasks and vacancies in e.g. a tanker-fleet or the fighting services).

    b) Short updating/balancing cycles are expensive (e.g. weekly versus monthly payrolls; management systems requiring daily situation reports; statistical output "as at yesterday" rather than "as at the end of last month").

    c) Elaborate coding and file structures are expensive (e.g. containing detailed job-analysis data- use of iterative rather than multi-axial code structures; extravagent organisation of classification codes, etc.)

d) "Trade-off" between capital and running costs (as in 'PRISMs" use of "inverted" files plus file-management programmes to give analytical speed and power: expensive in memory and initial programming but economical in running-time and other operating costs).

e) Availability of rapid-retrieval languages, routines and equipment (SPECOL,INFORMATICS MARK IV, "abstracted" working-tapes, visual display units, etc.)

f) Historical data is expensive - to find assemble and convert for start-up to hold in the system, or to retrieve if held separately from current files. It is also essential for many purposes. Approaches to the reconciliation of this dilemma can vary widely in cost.

6. There are also technological influences on cost, e.g. time-sharing- use of bureaus, consultants and software houses; the age, appropriateness, operating-mode and capacity of the hardware- whether single-purpose or multi-purpose installation, etc.

7. One would expect the costs and general efficiency of a system in meeting its purposes to be powerfully affected by its antecedents and the experience and know-how that went into its design i.e. by whether it is a first-or a subsequent-generation. An organisation can apply valuable lessons from the pastin designing a second-generation system. Esso made this point strongly.Others appear to be running very large and ambitious first-generation systems sucessfully, but possibly expensively. The costs instanced below of a computer company give evidence of economical and efficient first-generation operation, (though no doubt this enterprise has some inbuilt advantages over most systems-users). Fords of Germany started up and then scrapped an expensive accounting-machine operation when others were already operating computer-based systems, only to proceed to an evidently successful and very large and complex first-generation computer-system. Confident generalisations about costs and efficiencies of first-versus second-generation systems are clearly dangerous, and more information would be valuable.

8. Costs incurred at different times need to be indexed for comparison. This chapter is not intended as a rigorous cost-comparison, but as a rough-and-ready guide. In the example below we have applied a 15% discount to current costs to bring them into approximate line with the PRISM costs quoted in 1969.

9. All the case studies, and all the cost-examples quoted in this chapter are of medium to very large populations. We are conscious that they may be of little help to smaller potential users, and that too little is confidently known of whether the 'state of the art" and the current development of the computer industry as a whole begins to permit-perhaps on a shared basis - realistic and economical applications in smaller firms and institutions. PRISM's Network design may begin to provide some evidence.

It may now be more readily apparent why we have attempted no more than a brief descriptive indication of system costs in various applications. There is really no sensible half-way house between this and a thorough-going separate study. We are grateful to the organisations concerned for their co-operation: even this degree of information involved several of them in troublesome research on our behalf.

We repeat that we are attempting nothing more ambitious than the most approximate indication to potential or actual users, of costs incurred by several well-known organisations and of the likely costs of PRISM. Certainly no comparison of efficiency as such is intended or indeed may be inferred from such figures. We would suggest, however, that the British taxpayer may be reassured that his money is being well spent should the Civil Service Department meet their more essential needs within the approximate bounds of their cost projections for PRISM.

System: CIVIL SERVICE DEPARTMENT (PRISM)

Integrated: Yes

Scope: Payroll & Personnel, for most Civil Service Departments and many associated government agencies. Approx. 500,000 records. Includes weekly-paid, but excludes Industrial (manual grade) Staff.

Divisor: 500,000

Hardware: Will move from current situation of a number of machines of various makes and capacities (majority ICL) in different locations towards a network of 10 to 12 machines, one of which will act as a central computer for PRISM. It is hoped this may be reduced by end Phase II (after 10 years) to a central machine plus 3 to 5 peripheral machines covering between them all participating organisation, with own software.

Features: Weekly update. Initially develop common payroll system plus mandatory personnel elements (about 80) and comprehensive central personnel system for senior staff. Extend in Phase II to fully-comprehensive pay-personnel system. Great flexibility, scope for local requirements, and inter-communication within Network. Emphasis on flow as well as stock analysis. Historical data retained in main files, all items dated and sequenced. Individual record elements indexed and counted in separate "Countflow" file structure to optimise access both for individual and statistical purposes. Use of domestic rapid-retrieval language. About 110 regular outputs at centre, plus any peripheral requirements.

History: PRISM now under development. Phase I 1970-74, Phase II 1975-79. Supersedes present numerous individual (and some manual) pay and personnel systems.

Cost Basis: Incremental, i.e. costs shown represent additional expenses necessary to achieve PRISM. Thus costs of systems forming part of PRISM (e.g. computerised payrolls) but which existed or were firmly planned prior to PRISM are excluded. The cost figures are, of course Civil Service estimates, which the authors have re-cast into terms of Capital, Start-up and Operating. £'000 (1969 values). "Nett" after savings on simple non-DCF basis. Per-capita costs in parentheses.

Estimated Cost:

ONCE-OFF			OPERATING - "SYSTEM ONLY"		
(fully operational - cumulative development costs for first 10 years)			Personnel phase only, in 10th year, i.e. annual basis.		
Capital	2406	(6.3)	Gross	1190	(2.4)
Start-up	2652	(6.9)	Savings	358	
Total	5058	£13.2)	Nett	832	(1.7)

(i.e. excluding costs of manpower planning/personnel applications as opposed to system operation to produce the information for such applications).

For a more detailed analysis see page 198.

ESTIMATED GROSS & NET COSTS OF INTEGRATED PRISM SYSTEM FOR 500,000 EMPLOYEES

Costs by Central System, Network System, Communications, & Overall, in £'000 (1969 values)

TYPE	PHASE I (Total years 1-5)				PHASE II (Total years 6-10)				CUM. TOTAL AFTER FIRST 10 YEARS				CUM. YR. 18 (O'all)
	Central	N'work	Comm.	O'all	Central	N'work	Comm.	O'all	Central	N'work	Comm.	O'all	
Capital Start-up Operating	1,059 788 439	37 852 48	103 - 19	1,199 1,640 556	165 25 2,389	366 984 391	676 3 387	1,207 1,012 3,167	1,224 813 2,828	403 1,836 489	779 3 406	2,406 2,652 3,723	5,402 2,652 12,759
Total - Gross	2,286	987	122	3,395	2,579	1,741	1,066	5,386	4,865	2,728	1,188	8,781	20,813
(Less Savings) Oper. - Nett	- 439	- 98	- 19	- 556	(516) 1,873	(321) 70	- 387	(837) 2,330	(516) 2,312	(321) 168	- 406	(837) 2,886	(8,680) 4,079
Total - Nett	2,286	987	122	3,395	2,063	1,420	1,066	4,549	4,349	2,407	1,188	7,944	12,133

OPERATING COSTS AT VARIOUS STAGES

	FOR YEAR 5				FOR YEAR 10				FOR YEAR 15			
	Central	N'work	Comm.	O'all	Central	N'work	Comm.	O'all	Central	N'work	Comm.	O'all
Gross Costs (Less Savings) Nett Costs	439 - 439	60 - 60	20 - 20	519 - 519	503 (103) 400	507 (255) 252	180 - 180	1,190 (358) 832	483 (152) 331	410 (828) (418)	241 - 241	1,134 (980) 154

PRISM £/CAPITA COSTS (500,000 POP.)

		PHASE I	PHASE II	CUM. 10 YRS.
"ONCE-OFF": (costs of establishing system)	Capital Start-up	2.4 3.3	2.4 2.0	4.8 5.3
	Both	5.7	4.4	10.1
+ Accummulative (Gross) Op. Costs		1.1	6.3	7.4
Accummulative Total		6.8	10.7	17.5

"ONGOING" (i.e. operating costs)	5TH YEAR	10TH YEAR	15TH YEAR
Gross	1.0	2.4	2.3
Nett	1.0	1.7	0.3

Notes

1. Capital for hardware not amortized, but if it were the operating costs would be correspondingly greater.
2. Accommodation etc. costs on rental basis i.e. within operating costs, not capital costs.
3. The above analysis is for all practical purposes that of developing and operating PRISM as a personnel system excluding purely payroll applications (see detailed explanation in main Appendix "Costs and Cost Comparisons").

System: ESSO PETROLEUM CO. LTD.

Integrated: Yes

Scope: Payroll and Personnel, complex Compensation and Benefits administration. Computerised 14-Company Scatterchart Survey system. Links with separate EEMIS (Europe-wide) personnel system. Includes annuitants and expatriates and associated U.K. companies. About one quarter employees weekly-paid.

Divisor: Personnel 12,000 (11,300 + 1 year's leavers), Payroll 18,000 (11,300 + expatriates and annuitants).

Hardware: IBM 360/65. Own software. Approx. £220 hour = £87 - £132 CPU time plus all peripheral costs.

Features: Payroll weekly update, Personnel monthly update. 25 standard Personnel outputs. Use of Informatics Mark IV rapid-retrieval language. Personnel system primarily statistics-orientated but increasing individual data applications. Investigating use of Visual Display Units. Separate history and leaver files.

History: Second-generation, operational since 1969. Supersedes previous separate Pay and Personnel systems, each at two locations.

Cost Basis: All computing costs and overheads charged out (including accommodation etc.) Salary overheads encompass inter alia accommodation, communications, training, removals, business expenses etc. Thus total costs of Payroll and Manpower Planning Divisions included, and their system's share of Computing Division's costs. Excluded are costs of users in e.g. remaining Divisions of Personnel Department and elsewhere. Capital costs included in operating costs as rental or amortisation. "Systems only" = costs within Manpower Planning Division of data and system operations, i.e. excluding management and systems applications such as analyses and forecasting. Costs in £'000 at approximate 1969 values. Per-capita costs in parentheses. "Nett" = after deduction of estimated savings on simple non-DCF basis and on conservative assessment. "Operating" includes some on-going development.

Reported Costs: (excluding those of independent Marine computerised personnel system)

START-UP

	Payroll	Personnel		Total
Systems Dev't	70	43	=	113
Computing	32	16	=	48
Total	102(5.7)	59(4.9)	=	161(8.9)

OPERATING

	Payroll	Personnel		Total
Computing	58	11	=	69
Departmental	102	24	=	126
Gross Total	160(8.9)	35(2.9)	=	195(10.8)
Nett Total	29(1.6)	14(1.2)	=	43(2.4)
(Saving deducted from Gross)	131	21	=	152

(Divisors used: Payroll 18,000, Personnel 12,000 Total 18,000)

OPERATING: "SYSTEMS ONLY"

	Payroll	Personnel		Total
Computing	58	11	=	69
Departmental	102	8	=	110
Gross Total	160(8.9)	19(1.6)	=	179(9.9)
Nett Total	29(1.6)	NIL(-)		27(1.5)
(saving deducted from Gross)	131	21	=	152

NOTES

1. Costs Salary and overhead costs have been taken from actual departmental budgets and represent around 30 Head Office and 5 Fawley Refinery Payroll people and 5 Manpower Planning people. Staff overheads positively identified and budgeted for including accommodation, office services, training, removals, business expenses etc. as well as payroll benefits work out at about 100% on salary at Head Office and probably around 50% on average in field locations. This may appear high to some but probably under-estimates in practice. Another major oil company in this survey has arrived at an overhead figure of 150% on Head Office salaries after rigorous investigations. Most firms grossly under-estimate and under-report true costs of manpower. A further 10% overhead is included in manpower planning costs for abnormal floor space for data storage and peak labour.

2. Savings It is notoriously difficult satisfactorily to estimate what something would have cost in different circumstances. The nett figures shown represent Esso's best guess, on an honest and conservative approach, that some 45 more people would be employed in payroll applications and seven in personnel information applications were present work demands in these areas being met by the Hollerith - plus - manual methods used before the introduction of computers and associated software and systems. Since Esso was beginning to adopt these more than a decade ago and the pattern of work-demand has changed the estimate of 52 savings must necessarily be approximate. These 52 are split 45 Payroll and 7 Personnel.

3. "Systems Only" Only costs within Manpower Planning Division of maintaining a data bank and providing basic information for reports etc. (thus excluding all analytical, supervisory and compensation work) have been assumed here = two men instead of 5. Although straightforward cost comparisons within this survey are dangerous, this does give Esso costs on roughly the same basis as most of the other organisations' costs reported.

System: ROYAL AIR FORCE

Integrated: Yes - but excludes Pensions

Scope: World-wide. All personnel records. Other-ranks pay Payroll is primarily an accounting operation and excludes local pay-out routines. System designed for complex posting and deployment operations as well as personnel administration, and designed to cope with war-time demands and rapid expansion.

Divisor: 100,000

Hardware: Univac 1107 and software

Features: 20,000 daily inputs. Daily update. About 100 standard outputs. Elaborate forecasting routines.

History: First generation

Cost Basis: Includes amortisation and interest on capital in "Operating". Staff costs and overheads, accommodation, communications, etc. i.e. fully comprehensive overheads. On "System Only" basis (see Esso note) £'000 (1969 values). Monetary savings not quoted but system currently saving some 700 or so men.

Reported Costs:

ONCE-OFF

Capital	1,300	(1.3)
Start-up	900	(0.9)
Gross Total	2.200	(2.2)

OPERATING - "SYSTEMS ONLY"

Personnel and Payroll

Start up	800	
Gross Total	800	(0.8)

System: OIL COMPANY "A"

Integrated: No - personnel system described below

Scope: Separate files for both employees and posts. Includes annuitants.

Divisor: 11,000

Hardware: ICL 1901/1904

Features: About 500 standard outputs

History: First-generation. Start-up 1966, fully operational 1967.

Cost Basis: All computing costs and overheads and all salaries and inclusive overheads, at 150% of salary, per Esso. Data on original, capital and start-up costs and on savings unobtainable. "Operating" includes some on-going development. Operating Costs quoted are on "Systems Only" basis (see notes on Esso costs). Costs in £'000 at approximate 1969 values. Per capita costs in parentheses.

Reported Costs:

OPERATING - "SYSTEMS ONLY"

	Personnel	
Computing	23.8	
Departmental	55.7	
Gross Total	79.5	(7.2)

System: OIL COMPANY "B"

Integrated: No - personnel system described below.

Scope: Historical records including leavers are maintained in system. 15,000 active records, 24,000 total records.

Divisor: 15,000 + one year's leavers taken as basis, i.e. 16,500.

Hardware: Univac 1108/6

Features: Only about 15 standard outputs. Use of terminals plus domestically-developed rapid-retrieval language. Presently considering "indexed" or "profiled" file structure from individual record files (similar to Civil Service Department's "Countflow" approach) to further increase speed, power and economy. Update twice a month.

History: Second-generation system and recent change in hardware and manufacturer.

Costs Basis: Start-up costs were inflated by hardware change, but exclude hardware costs as such i.e. capital charges. Computing charges also exclude accommodation etc. overheads, as do salary overheads. Operating costs are on a "Systems Only" basis (see Esso notes). Per capita costs in parentheses, costs in £'000 at approximate 1969 values. "Operating" includes some on-going development.

START-UP

Personnel

Computing Systems Dev't	40
Personnel Dept.	3
Total	43(2.6)

OPERATING -"SYSTEM ONLY"

Personnel

Computing etc.	28
Gross Total	28(1.7)
Nett Total	20(1.2)

System: OIL COMPANY "C"

Integrated: No

Scope: Personnel data including compensation but excluding payroll and benefits administration and operations. Includes weekly-paid (manual) labour. Covers international expatriates, and all associated companies in U.K. 19,100 actual records and to date 4,900 leavers.

Divisor: Taken as 19,100 plus one year's leavers = 21,000.

Hardware: Univac 1108. Own software. Computer employed to date in Exec 2 mode, but planning change to Exec 8.

Features: Twice-weekly update. About 140 standard outputs. Rapid-retrieval language being developed domestically but not operational yet. No visual display units as such, but terminal links to centre at the bigger of the 17 user-locations. Primarily individual-data rather than statistically-orientated up to now. Complex compensation administration included.

History: Second-generation system, started-up in 1970. Previous system started 1964.

Costs Basis: Total costs of Computer Division including all overheads charged out to users. Running costs for this sytem charged out to the 17 user locations on basis of £25 /hr. File maintenance, updating and support etc. charged pro-rata on totals of records held at locations. Retrievals charged on basis of approximate historical utilisation of file. Capital and start-up costs unobtainable. Operating costs on basis of "System only" i.e. in this case includes no Manpower Planning/Personnel Department costs whatever. Includes some on-going development. £'000 (1969 values).

Reported Costs:

OPERATING - "SYSTEM ONLY"

	Personnel
File Maintenance	105.5
Output	60.5
Gross Total	166.0(7.9)

System: A COMPUTER COMPANY

Integrated: Presently two separate but parallel systems within separate Company functions - one integrated, one not. Developing company-wide integrated system on "confederal" and international basis i.e. at various main locations with no central system as such.

Scope: Mainly payroll, plus basic Personnel, in one; Personnel only in other. Excludes annuitants and most expatriates. Costs below are synthesised from both systems.

Divisor: 19,000

Hardware: ICL 1904A. Own software.

Features: Weekly update. One year's leavers on current file. Statistical and individual applications. Expatriates being added, and much additional information in new system being planned.

History: First-generation.

Costs Basis: Includes some Payroll costs - around one-quarter of costs reported. All computing overheads including accommodation charged. Comprehensive overheads, including accommodation, on salaries. "Operating" includes some on-going development. Costs on "Systems Only" basis i.e. excluding all Manpower Planning/Personnel costs. £'000 (1969 values).

Reported Costs:

START-UP

Share of capital	70(3.7)
Systems dev't & computing	60(3.2)
Total	130(6.9)

OPERATING -"SYSTEMS ONLY"

Personnel, some Payroll

All charges	51
Gross Total	51(2.7)

System: BRITISH OVERSEAS AIRWAYS CORPORATION (B.O.A.C.)

Integrated: Yes - Personnel, Pay and Pensions.

Scope: 16,000 monthly-paid, 5,000 weekly-paid, 4,000 annuitants. Expatriate records but not pay.

Divisor: 21,000

Hardware: IBM 360/65

Features: Daily update. Separate history files. Leavers in suspense file, later transferred to pension file as necessary. About 80 standard outputs. Planning to use Informatics Mark IV as rapid-retrieval language - none at present.

History: Operational April 1970. Replaced IBM 1400 basic personnel record system.

Costs Basis: Machine time charged at £46/hour which includes all overheads including accommodation, rentals etc. Comprehensive salary overheads. Depreciation costs of hardware included in operating costs. Operating costs exclude applications within Personnel Department. "Start-up" costs include the Payroll and Pensions phases, "Operating" is for Personnel phase only. £'000 (1969 value). This airline's computing costs are among the lowest of all European airlines.

Reported Costs:

START-UP (PPP phases)

Computing & System Devt.	208
Personnel Dept.	27
Gross Total	235 (11.2)

OPERATING -"SYSTEMS ONLY"
Personnel Phase only

Computing	46.3
Departmental	5.5
Gross Total	51.8 (2.5)

INSTITUTE OF PERSONNEL MANAGEMENT/INDUSTRIAL SOCIETY STUDY

Finally, in the recent British Study by Mrs. Springall for the IPM/IS ("Personnel Records & the Computer" - IPM/IS, 1971) some costs were discussed of systems surveyed in 1970. Two firms reported per capita operating costs of between £3.50 and £4.0 for personnel systems. An engineering company of 65,000 employees with an integrated pay/personnel system reported £3.9 operating cost per capita for the personnel aspect. Another engineering company of 45,000 with a real-time integrated system reported an overall per capita cost of only £1.2. This seems extremely low, but the survey does not spell out what overheads were or were not included. This can make a substantial difference to apparent costs. For example, Esso overheads on salaries appear from the costs quoted to be about 100%, while another oil company quoted 150%. These include all accommodation and related costs, which some other firms evidently exclude, confining their overheads to payroll items such as social security and pension contributions. The same factor of accommodation being included by some and excluded by others applies as well to computer charges borne by personnel or payroll departments. However, around £4 per head per annum would seem to be a rough average figure, for all but the very largest organisations, emerging both from the IPM/IS survey quoted above and from our own investigations.

The whole problem of costs and returns of manpower applications for computers would seem to be worthy of further study. The British survey quoted discovered that few firms appeared to know or even to care greatly what their start-up and operating costs and cost-benefits were. Most were taking advantage of hardware required in any case for other business purposes. The general conclusicn appeared to be that firms recognised that they had to have a computerised approach to manpower, e.g. to aid decision-making, and that it was thus scarecely worth the difficult task of analysing the economics of their systems. We ourselves found a lively interest in the economics among all organisations contacted, though all made the point that the easiest benefits to quantify - manpower savings - were less important if more tangible than other benefits such as speed and power of analysis, more systematic knowledge of manpower, better basis for forecasting and decision making etc.

TENTATIVE CONCLUSIONS

From our own modest investigations made in order to obtain some yardstick [illegible] the Civil Service and Esso case-studies we would suggest that we have learned or confirmed that

1. A stringent methodology will need to be evolved before comparative evaluations of costs and returns in this area can be made with any confidence.

2. Making due allowance for this, we have gained a rough-and-ready impression that even the negative benefits of manpower savings would appear to justify an organisation investigating the possibility of computerising manpower and payroll data and associated operations. However, the more important and long term benefits may not be easily quantifiable and have to be felt as a need, or at least be taken on trust, by management. To put this another way, manpower economics is a young and not widely appreciated discipline.

3. There may be even wider cost differences between payroll applications than between personnel systems, or aspects of systems. Payroll cost/population ratios may be more linear than personnel ones. Little hard information seems available on the costs of payroll applications.

4. There appears indeed to be a strong economy-of-scale effect: very large systems are clearly much cheaper on a per capita basis than smaller ones (and this might be expected to apply more to personnel than to payroll applications). The parameters are unclear. The per capita ratio curve may well begin to flatten at around 20-30,000 records. There is, however, a wide apparent variation in per capita costs among smaller populations and even between firms in the same industry (but see 1 above).

5. The subjects of the two British case studies would appear to show comparatively low costs.

The above conclusions, while scarcely unexpected, may encourage others better qualified to study these matters in greater depth.

CHAPTER V

ANALYSES OF THE STUDY

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QUESTIONNAIRE I

International Study into the Development of Extended Applications of Electronic Data Processing in Personnel Management and its implications on Labour Markets

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PART ONE

NOTES FOR GUIDANCE TO QUESTIONNAIRE

ON

An International enquiry into the development of Extended Applications of Electronic Data Processing in Personnel Management and its implications on Labour Markets.

1. General

This questionnaire is the first part of a Study commissioned by the Organisation for Economic Co-operation and Development into the development of EDP in personnel areas. Briefly, the questionnaire is designed to determine the extent of your EDP application in personnel areas. If your system is still in the planning stage, the questionnaire attempts to determine the nature and extent of your proposed system.

The consultants commissioned by OECD to conduct this survey, The Swedish Council for Personnel Administration, have given the undertaking that any data you furnish in this questionnaire will be handled in confidence. No reports or statistical tables will identify or relate data provided by you to your company without your express consent. You will be furnished with draft copies of all reports and tables prior to publication to ensure that this confidentiality clause is upheld.

In the attached letter the answers provided by you may indicate that your company will be selected for a rather more detailed questionnaire and personal interview undertaken by the consultants. Should this situation arise, your co-operation in providing data for Part Two of the Survey will be greatly appreciated.

PART ONE

QUESTIONNAIRE

An international enquiry into the development of Extended Applications of Electronic Data Processing in Personnel Management and its implications on Labour Markets.

Notes for Completion of the Questionnaire

The questionnaire has been divided into five parts.

Section A - is concerned with details of your company
Section B - is concerned with details of your system (actual or planned)
Section C - is concerned with the relationship between the personnel system and other functional EDP Systems
Section D - is concerned with the system configuration
Section E - is concerned with more general items of interest

QUESTION NUMBER	SECTION A	THIS COLUMN FOR OFFICE USE

Section A - This section aims at determining in general terms the size and organisational structure of your company. The name and address shown in Q 1.1. should be the name and postal address of the unit completing the questionnaire. Q 1.2 should be completed only if the respondent is part of an international company or group of companies. Q 1.3 should be completed by all other respondents. A reply to Q 1.2 implies no response to Q 1.3 and vice versa.

1.1. COMPANY NAME ______________________________

ADDRESS: ______________________________

____

____

Phone: ______________________________

1.2. Which level of organisation most aptly describes the above named unit? (Please tick appropriate box)

A. INTERNATIONAL HEADQUARTERS (of an international company or group of companies) ☐
B. REGIONAL HEADQUARTERS " " " " ☐
C. NATIONAL HEADQUARTERS " " " " ☐
D. MAJOR GROUP, SUBSIDIARY OR DIVISION " " " " ☐
E. OTHER OPERATING UNIT " " " " ☐

(specify) ______________________________

Example: The European headquarters that controls the operation in several countries would tick "B"; whereas the intermediate headquarters for a specific country (e.g. IBM (U.K.) Ltd.) would tick "C".

QUESTION NUMBER | THIS COLUMN FOR OFFICE USE

1.3 If the unit shown in Q 1.1 is not part of an international organisation, please indicate below the level of organisation that most aptly describes the unit.

A. NATIONAL OR MAIN HEADQUARTERS (of a multi-unit company or group of companies) ☐
B. REGIONAL OR INTERMEDIATE HEADQUARTERS " " " ☐
C. GROUP, SUBSIDIARY OR DIVISION OF A OR B ABOVE " " " ☐
D. OTHER OPERATING UNIT OF C ABOVE (specify) ____________________ ☐
E. SINGLE UNIT OPERATION ☐

Example: If the unit shown in Q 1.1. is the sole establishment with no other superior or subordinate units, the appropriate tick would be "E". If the unit shown in Q 1.1. is part of the headquarters for a large company or group of companies, A-B-C or D would be ticked as appropriate.

1.4 Please indicate name and address of parent company or head office:*

____

____

____

____

*Note: The name and address required here is the ultimate controlling organisation - not an intermediate headquarters. (e.g. an I.B.M. company would indicate the U.S. company here.)

1.5. SECTION OF INDUSTRY

Q. 1.5. is meant to identify which branch or section of industry your plant or company as shown in Q 1.1. is a part, not the controlling company. In other words, if your parent company is primarily a motor car manufacturer, but the plant or company shown in Q 1.1. only produces components for a motor car; the Section of Industry shown in Q 1.5 would be - Manufacture of Car components.

Please state main product or function

____

e.g. Motor-car manufacturer, Banking, Telecommunications equipment manufacturer, banking etc.

1.6. Is the company state owned? (i.e. nationalised) ____YES____NO

QUESTION NUMBER		THIS COLUMN FOR OFFICE USE

1.7 Q. 7 is related to the employee size of the unit shown in Q 1.1. If Q 1.2 or A, B, C or D of Q.3 has been ticked please indicate in part B of this question the number of employees subordinate to that organisational level shown.

e.g. If the respondent to Q.1. is a regional HQ we want to know the number of employees in that region.

COMPANY SIZE: indicate in part A the number of employees employed at Location shown in Question 1.1 above.

A (Staff Employees ____________

A (Manual Employees ____________

indicate in part B the number of employees controlled by the unit level shown in Q 1.2 or Q 1.3.

B (Staff Employees ____________

B (Manual Employees ____________

SECTION B

Section B - This section is concerned with the nature and extent of your EDP system or proposed system, as it pertains to personnel only.

Q. 1.8 is shown to determine if the functional head is responsible for the operation, development and maintenance of his own system.

Q. 1.9 will be approximate only as it is difficult in some instances to be exact in these matters. By operational we mean the date you had your first print out that was used for the purpose for which it was designed, not output for checking systems etc.

Q. 1.11 is an attempt to determine the extent of your current and planned system. Rather than ask for samples of input and output documents, or long lists of applications, we believe sufficient data can be obtained by analyses of the grid in Q 1.11. Please complete the grid as completely as possible as follows.

The lines 1 to 12 indicate the types of data your system collects and records.

Each line is divided into A-staff, and B-manual.

line 1 - Personal Identification Data includes such items as name, sex, marital status, date of birth, date of joining company, medical data (if recorded) etc.

line 2 - Benefit & Employment Data refers to such items as service contract (if any), hours of work, shift arrangements, holiday and pension entitlements, limitations on type of employment, etc.

line 3 - Internal company identification refers to department identity, job code or classification, job grade, skill classification, hierarchal position indication, place of work (location as opposed to department or section), status (manual, staff, apprentice ---) etc.

line 4 - Employee Performance Data refers to appraisal or other employee assessment - could possibly include test data.

line 5 - Wage Details. As the term implies, all particulars with respect to manual workers remuneration.

line 6 - Salary Details. As line 5 for staff employees.

line 7 - Education Details refers to all items collected relevant to education and training.

line 8 - Extra Firm Details refers to such items as source of recruitment, data collected to satisfy government or other external agency requirements.

line 9 - Compensation and Benefits - implies more than just wage and salary details. Input here would be necessary to monitor and administer a complete compensation package - e.g. pension, company car, top hat pension, etc.

line 10 - implies more than data relevant to wage and salaries. Input here would include overtime worked, overtime premiums paid, and all other manpower costs both paid as remuneration to the employee or cost to the company for that employee, e.g. training, overheads, etc.

line 11 - Training Data. This refers to recorded training both internal and external - not the cost data which would be recorded under line 10.

line 12 - Other refers to any set of data not previously mentioned. If this is applicable to you please state briefly the nature and type of data collected, in the space provided after Q 1.24.

The colums C to E indicate whether items in lines 1 to 12 are either collected and recorded now (C), currently being developed (D) or planned for future collection (E).

To indicate the extent of coverage, please put a tick (✓) in the appropriate column(s) against the applicable line number(s).

For example:- If you now collect and record Personal Identification Data (line 1) for manual employees (B), you would place a tick (✓) in column C in line 1.B.

If you are in the development stage of collecting and recording Educational Data (line 7) for staff employees (A), you would place a tick (✓) in column D in line 7.A.

If you are planning, at some future date; to collect and record employee performance details (line 4) for both staff and manual employees (A and B), you would place ticks (✓) in column E in line 4, both A,B and so on.

QUESTION NUMBER | | THIS COLUMN FOR OFFICE USE

The columns 1 to 21 indicate some possible uses (output) of the data collected. The terms used seem to require no definition except columns 10 and 11. In these columns by labour statistics we mean such things as wage and salary levels - or averages - hours of work, occupational analysis, etc.

To record the output from the system please indicate in the appropriate column (1 to 21) the letter heading combinations (C,D or E combinations) against each line number (1 to 12) that provides input to that output. For example: - if you now provide a payroll routine for manual workers and the data required to provide this output comes from Personal Identification (line 1), Benefit Data (line 2), Internal Company Identification (line 3) and Wage Details (line 5), you would enter the letter C (collected now) under Column 1 (payroll) in lines 1 B, 2 B, 3 B and 5 B.

Note: It is essential that column C, D and E be completed before showing the output in columns 1 to 18. This is necessary because there must be an element of compatibility between the ticked (✓) responses to columns C to E and the output indicators. That is to say the constraint on the grid is that there cannot be "C" under any column 1 to 21 on any line 1 to 12 unless there is a tick (✓) under column C for that line. It is possible however to have D or E marked in one of the columns 1 to 21 on any line that may have column "C" ticked (✓).

For example: -

You may already collect and record Salary details (causing a tick (✓) in column C, line 6), but only use the data for payroll (hence the indication of C, line 6 A, column 1); but you plan to use this data (salary details) in the future for salary administration (column 5). This would necessitate the indication of E in column 5, line 6 A (plus any other line that requires input for a salary administration programme).

1.8 Name and Title of Official responsible for the Personnel E.D.P. System:

NAME ______________________________

TITLE ______________________________

1.9 How long has the E.D.P.Computer System in Personnel been in operation?
Or, if not yet operational, how long has planning and feasibility study taken to date?

FOR OPERATIONAL SYSTEMS ______ YEARS ________ MONTHS

FOR NON OPERATION (PLANNED) SYSTEMS _______ YEARS _____MONTHS

What type of equipment is now being used? _________________

____

Are your files disc or tape? (Please tick) DISC ☐ TAPE ☐

Do you plan to - or have you already - undergone a transition from one type of system to another? (e.g. from a panel card/Tabulator environment to computer environment). Please comment, in the space provided after question 1.24, and if possible indicate length of time transition required.

QUESTION NUMBER

THIS COLUMN FOR OFFICE USE

1.10 Give an approximation of both the number of man months and the total length of time required to plan and install your system - or if not yet operational - how long in TOTAL have you allowed for planning and installation: -

For Operational Systems ____________ Months

" " " ____________ Total length of time (months)

For Non-operational Systems __________ Months

" " " " __________ Total length of time (months)

1.11 This question is an attempt to examine the extent of your E.D.P. application and to determine the uses made of the inputs in the system. Please score the appropriate box on the grid below in accordance with the instructions. With respect to this question, please indicate the number of employees controlled by your system (real or planned).

Staff Employees _____________

Manual Employees ____________

GRID

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE			OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Collected now	Currently being Developed	Planned for Future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Specify in Q 1.24
LINE NO.		C	D	E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.PERSONAL IDENTIFICATION DATA	A Staff																								
	B Man.																								
2.BENEFIT DATA	A Staff																								
	B Man.																								
3.INTERNAL COMPANY IDENTIFICATION	A Staff																								
	B Man.																								
4.EMPLOYEE PERFORMANCE DATA	A Staff																								
	B Man.																								
5.WAGE DETAILS	A Staff																								
	B Man.																								
6.SALARY DETAILS	A Staff																								
	B Man.																								
7.EDUCATION DETAILS	A Staff																								
	B Man.																								
8.EXTRA FIRM DATA (SPECIFY IN Q 1.24)	A Staff																								
	B Man.																								
9 COMPENSATION & BENEFIT ADMINISTRATION	A Staff																								
	B Man.																								
10.MANPOWER COST (GROSS) DATA	A Staff																								
	B Man.																								
11.TRAINING DATA	A Staff																								
	B Man.																								
12. OTHER (SPECIFY IN Q 1.24)	A Staff																								
	B Man.																								

QUESTION NUMBER	SECTION C	THIS COLUMN FOR OFFICE USE

Section C - This section is an attempt to determine the extent of integration of your system. Before answering the Question 1.12 by a Yes or No in the appropriate column, bear in mind, that we are concerned only with input or output from another functions EDP System . If such input and output is through a programme module (e.g. not manual provision of tapes, listings, etc) we would like notation of this fact in Q 1.24.

1.12 Does the Personnel System depend upon or Provide Data to other Functional E.D.P. Systems?

Please tick appropriate box

INPUT TO PERSONNEL SYSTEM			OUTPUT TO OTHER SYSTEMS		
FUNCTION	YES	NO	FUNCTION	YES	NO
FINANCE			FINANCE		
MARKETING			MARKETING		
PRODUCTION			PRODUCTION		
TECHNICAL			TECHNICAL		
MANAGEMENT SERVICES			MANAGEMENT SERVICES		
OTHER (SPECIFY)			OTHER (SPECIFY)		

SECTION D

Section D - These questions are concerned about the environment surrounding your system.

In Q 1.19 please answer yes only if the data you provide to higher headquarters emanates from your computer oriented system.

In Q 1.20 please answer yes if you are functioning as a centralised personnel recording system. In this instance we would like to know how the data is furnished to the central system (e.g. tapes, terminals, record sheets, other documents). Please indicate the mechanics of input to the centralised system in Q 1.24.

1.13 Does your company own its own computer?

____ YES ____ NO

1.14 If YES to Question 1.13, do you use the computer wholly for personnel use?

____ YES ____ NO

1.15 If NO to Question 1.13, do you rely wholly upon an outside bureau?

____ YES ____ NO

1.16 If NO to Question 1.13 do you share a computer with another company or companies exclusively? e.g. joint purchase, leasing.

____ YES ____ NO

1.17 Did your company develop your system?

____ YES ____ NO

QUESTION NUMBER | | THIS COLUMN FOR OFFICE USE

1.18 If NO to Question 1.17, did you (1) use or modify a standard package? (2) Hire a Programme writing bureau? (3) Employ consultants? (4) Other (specify) ____________________

Please underscore the most applicable phrase or phrases.

1.19 If you are a part of a larger company or group of companies, do you provide data to the parent or head office? And do you also get feed back from that controlling unit?

____ YES ____ NO

If YES, please indicate column number(s) from output grid in Question 1.11 ____________________

1.20 If you are the parent or head office of a larger company or group of companies, do you receive (and feed back) data from your branches, divisions or subsidiaries?

If YES, please specify: ____ YES ____ NO

a. The number of units who provide data ____________________
b. Updating frequency ____________________
c. The column number(s) from output grid in Question 1.11 of data received ____________________

Note: Q 1.20 should be expressed in terms of EDP systems.

SECTION E

Section E - This section is an attempt to determine any constraints or influences from an external agency on the design and development of your system.

If the answer to Q 1.21, 1.22 or 1.23 is YES, we would appreciate qualitative details in Q 1.24.

1.21 Did the local labour market have any influence on the design and/or use of the system?

____ YES ____ NO

1.22 Did governmental legislation have any influence on the design and/or use of the system?

____ YES ____ NO

1.23 Could you please give an indication here if the geographic area of your location is considered to be a development area by your government?

____ YES ____ NO

1.24 Please give the general motivation for applying EDP in the personnel area.

____

____

1.25 Please indicate below any further comments you would like to make about your system in general. We are especially interested in specific problem areas; development; usage of the system.

____

____

____

ANALYSIS OF PHASE I - QUESTIONNAIRE

Stockholm, December 1970

The Swedish Council for Personnel Administration
District of Stockholm

Kjell Janson
Bengt Linder

CONTENTS

1. Report of Questionnaire I

1.1 Size and organisational structure of participating companies.

1.2 Nature and extent of actual or planned EDP systems for personnel.

1.3 Integration of the EDP personnel system to other functions EDP system.

1.4 Systems configurations.

1.5 Constraints and influences from external agencies on the design of the EDP system.

1.6 Further comments.

APPENDIX Statistical analysis of the answers to question 1.11

1. Report of Questionnaire 1.

The results of Questionnaire I are presented below in accordance with the devision into sections that was done in the enquiry.

Most of the results are shown in tabular form with total sample figures as well as by country. Additionally, some of the tables have been commented upon and analysed to some degree, where this has been considered appropriate.

As a consequence of the uncertainty to the figures of the size of the companies and to the difficulty in analysing such data, we have just reported the size of the companies in terms of number of employees, both for manual and staff without any further analysis.

Because of the great number of branches or sections of industry that are represented in this study, we have considered it of no statistical interest to analyse the answers in this respect.

A statistical analysis of question 1.11 (the "grid") has been made by Mr. J.E. Bayhylle concerning the 35 companies which were the first to send in their answers. A complete account of this analysis is given in Appendix 1.

1.1 Size and organisational structure of participating companies.

TABLE 1: Total number of companies

	AUSTRIA	FRANCE	GERMANY	GREAT BRITAIN	SWEDEN	SWIZERLAND	Total
Received	4	7	10	9	5	3	38
Planned	3	4	10	12	6	3	38

Comments on Table 1:

The reasons for the differences between the numbers of planned and received questionnaires in table 1 are due to national settlements.

To avoid cumbersome tables wer have preferred to use abbreviations for the names of the respective countries as shown below:

A = Austria

F = France

G = Germany

GB = Great Britain

S = Sweden

SZ = Switzerland

TABLE 2: Number of companies in international organisations (Q. 1.2)

Level of organisation in an international organisation	A	F	G	GB	S	SZ
1. International headquarters		2	3		2	
2. Regional headquarters						1
3. National headquarters	2	4	3	3		1
4. Major group, subsidiary or division		1				
5. Other operating unit	1			1		
SUM /24/	3	7	6	4	2	2

TABLE 3: Number of companies in national organisations. (Q. 1.3)

Level of organisation in national organisations	A	F	G	GB	S	SZ
1. National or main headquarters			2	5	2	
2. Regional or intermediate headquarters	1					
3. Group, subsidiary or division of A or B above			1		1	
4. Other operating unit of C above (specify)						
5. Single unit operation			1			1
SUM /14/	1		4	5	3	1

TABLE 4: Companies divided into branches or sections of industry. (Q.1.5)

Branches	A	F	G	GB	S	SZ	Total
Aircraft industry		1			1		2
Atom industry		1					1
Banks		1					1
Car industry			1	1			2
Central Government				1			1
Chemical-technical industry	1		1			1	3
Communications		1	1	1		1	4
Data industry	1		1	2	1		5
Electricity works		1	1	1			2
Electronic industry	1		1		1		3
Food production industry						1	1
Insurance companies			1		1		2
Iron- and steel works	1		1		1		3
Mining				2			2
Oil industry		2	1	1			4
Rubber industry			1				2
Total	4	7	10	9	5	3	38

TABLE 5: Companies divided into state owned (i.e. nationalised) and private. (Q.1.6)

	A	F	G	GB	S	SZ	Total
State owned	1	5		5			11
Not state owned	3	2	10	4	5	3	27

TABLE 6: Size of companies expressed in number of employees. (Q.1.7)

- Total figures in table A.
- Divided into countries in tables B-G

A. Total Figures

Staff						
10.001 -	4			1	2	7
5.001 - 10.000	2					1
2.501 - 5.000		1	1	1	1	
1.501 - 2.500			1	1	1	1
501 - 1.500	5		2	1	1	
0 - 500	3					1
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.001 -

B. AUSTRIA

Staff						
10.001 -						
5.001 - 10.000						
2.501 - 5.000						
1.501 - 2.500					1	
501 - 1.500	1			1	1	
0 - 500						
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.001 -

C. FRANCE

Staff						
10.001 -	1			1	1	1
5.001 - 10.000						
2.501 - 5.000						
1.501 - 2.500			1			1
501 - 1.500	1					
0 - 500						
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.000 -

D. GERMANY

Staff						
10.001 -					1	3
5.001 - 10.000	1					1
2.501 - 5.000			1		1	
1.501 - 2.500				1		
501 - 1.500	1					
0 - 500						
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.000 -

E. GREAT BRITAIN

Staff						
10.001 -	3					2
5.001 - 10.000						
2.501 - 5.000		1				
1.501 - 2.500						
501 - 1.500	1					
0 - 500	2					1
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.000 -

F. SWEDEN

Staff						
10.001 -						1
5.001 - 10.000						
2.501 - 5.000				1		
1.501 - 2.500						
501 - 1.500	1		1			
0 - 500	1					
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.000 -

G. SWITZERLAND

Staff						
10.001 -						
5.001 - 10.000	1					
2.501 - 5.000						
1.501 - 2.500						
501 - 1.500			1			
0 - 500	1					
Manual →	0 - 500	501 - 1.500	1.501 - 2.500	2.501 - 5.000	5.001 - 10.000	10.000 -

Comments on table 6:

In studying these tables one should be aware of the fact that there are differences between the countries and enterprises in the definitions of manual and staff employees.

1.2 Nature and extent of actual or planned EDP systems for personnel.

TABLE 7: Years that the EDP systems have been in operationg respectively and time for planning up to date. (Q.1.9)

	Number of companies with EDP-system	
Years	In operation	In planning stage
1	6	6
2	6	5
3	3	1
4	1	
5	4	
6	4	
7	1	
8	1	
9	1	
10	4	
11	1	
12	2	
Σ	34	12

Four companies have not answered to this question at all.

TABLE 8: Kind of files (Q.1.9)

File	A	F	G	GB	S	SZ	Sum
Disc	1			1		1	3
Tape		6	4	5	3	1	19
Disc and tape	3	1	6	3	2	1	16

TABLE 9: Man months and total length of time in months to plan and install operational systems. (Q.1.10)

Manmonths						
300 -		1		1	1	2
250 - 299			1			
200 - 249		1		1		
150 - 199		1	1			
100 - 149						
50 - 99		2	1			
1 - 49		6				
Total length of time in months →	1-12	13-24	25-36	37-48	49-60	61-

Nineteen companies have not answered this part of the question or have given incomplete answers.

TABLE 10: Man months and total length of time in months allowed for planning and installation of planned systems (Q.1.10)

Manmonths						
300 -			2		1	2
250 - 299			2			
200 - 249						
150 - 199						
100 - 149			1			
50 - 99		1	1			
1 - 49	1	2				
Total lengths of time in months →	1-12	13-24	25-36	37-48	49-60	61-

Twenty five companies have not answered this part of the question or have given incomplete answers.

Comments on tables 9 and 10

It is difficult to come to any positive conclusion concerning these tables because of the great number of answers missing on the one hand, and on the other due to the difficulty encountered by companies in giving "acceptable" information. This seems generally to be due to the fact that the planning of a data system of this character is more of a continuous process rather than of a delimited project.

The results of question 1.11 (i.e. the grid) are presented in tables 11-30 showing the figures per country.

The three stages of development, i.e. collected now (tables 11-17) currently being developed (18-23) and planned for future (24-30), are presented separately.

To facilitate a survey of these tables we have put a circle round the most frequent answers.

We have also commented briefly upon these tables, even though we are aware of the difficulties in doing so with such a small sample.

Comments on GRID C, i.e. stage - collected now:-

There is a similar pattern over the boundary-lines indicating that the input data most frequently collected are personal and internal company identification data together with benefit and manpower cost (gross) data and wage/salary details and these data are being used mostly for payroll systems with internal labour statistics and headcount like other ordinary outputs.

Table 11

GRID C = Collected now Tot.

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

INPUT ITEMS		STAGE Collected now	OUTPUT - USE OF INPUTS																				
			Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	30	28	21	18	6	27	7	11	6	10	25	18	14	10	4	18	16	13	7	5	6	1
	B Man	28	27	19	17	5	7	26	8	5	9	22	16	14	8	1	18	12	11	7	4	5	-
2 BENEF. DATA	A St.	26	20	11	4	2	17	4	2	1	3	12	9	9	5	-	8	6	7	1	2	4	-
	B Man	22	17	8	2	1	3	13	1	1	2	8	5	6	3	-	4	3	4	-	2	3	-
3 INTERNAL COMP. IDENT.	A St.	29	21	22	19	8	22	7	10	5	12	23	11	13	8	3	14	13	7	3	4	5	1
	B Man	25	18	19	16	7	6	19	7	4	10	17	8	11	7	1	14	8	5		5	5	-
4 EMPL. PERF. DATA	A St.	7	2	2	1	-	4	1	3	4	3	3	1	3	-	1	1	2	1	-	1	-	-
	B Man	8	2	2	1	1	-	3	1	3	2	3	2	3	1	-	3	2	1	1	1	-	-
5 WAGE DET.	A St.	5	4	2	1	1	4	2	1	-	-	5	3	3	-	-	2	2	1	-	-	1	1
	B Man	25	23	9	2	5	4	21	2	2	2	20	13	16	1	2	6	10	5	1	2	8	-
6 SALARY DET.	A St.	29	26	11	3	6	26	6	7	2	5	21	16	16	2	4	8	15	7	3	1	8	1
	B Man	7	5	1	-	1	4	4	2	1	1	4	3	1	-	-	1	2	2	-	1	2	-
7 EDUC. DETAILS	A St.	17	1	4	5	4	3	1	6	1	4	8	5	4	5	3	5	2	2	3	1	1	-
	B Man	10	1	2	3	1	1	2	2	-	1	4	-	-	2	1	4	1	1	1	-	-	-
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	14	5	7	5	2	6	1	1	-	2	5	8	2	2	1	4	3	1	-	1	1	2
	B Man	10	3	5	4	2	2	4	-	-	1	4	6	1	2	-	3	1	-	-	1	1	1
9 COMP.& BENEF. ADM.	A St.	22	14	2	-	-	15	4	-	-	1	9	6	5	1	-	1	4	6	-	1	4	3
	B Man	17	12	1	-	-	4	10	-	-	1	6	3	3	-	-	-	2	4	-	1	2	2
10 MAN-POW. COST (GROSS) DATA	A St	29	19	8	1	-	24	5	1	-	1	16	9	5	3	-	5	7	2	-	3	5	-
	B.Man	27	18	7	1	-	5	22	1	-	1	15	6	4	3	-	4	7	1	1	3	4	-
11 TRAIN. DATA	A St.	10	-	7	1	1	1	-	3	1	2	2	-	-	2	-	2	1	-	2	1	-	-
	B Man	7	-	7	1	7	-	2	2	-	1	2	-	-	2	-	1	1	-	2	-	-	-
12 OTHER (SPEC. IN Q 1.24)	A St.	8	3	3	1	3	4	1	2	-	2	5	1	-	1	-	2	1	-	-	-	1	1
	B Man	5	3	2	-	2	-	3	1	-	1	2	1	-	1	-	2	1	-	-	-	1	1

Table 12

C R I D C = Collected now Austria

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	④	④	③	2		④			1		2	1	1	1		1	2	1				
	B Man	④	④	③	2			④		2		③	③	2	1		3	2	1				
2 BENEF. DATA	A St.	③	2				1					1	1	1									
	B Man	③	2	1				1				1	1	1									
3 INTERNAL COMP. IDENT.	A St.	④	2	2	1		③					1		1				1					
	B Man	④	2	3	1			2		1		1	1	2			2	1					
4 EMPL. PERF. DATA	A St.	2					1		1	1	1			1				1					
	B Man	2						1	1	2	1	1	1	1	1		1	1					
5 WAGE DET.	A St.																						
	B Man	④	④	2				3		1		3	2	2			1	1					
6 SALARY DET.	A St.	④	④	1			4	1				2	1	1				1					
	B Man																						
7 EDUC. DETAILS	A St.	1																					
	B Man	1																					
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.28)	A St.	2	1	1			1						1										1
	B Man	2	1	1				1					1										1
9 COMP.& BENEF. ADM.	A St.	2	1				1																1
	B Man	2	1					1															1
10 MAN-POW. COST (GROSS) DATA	A St	④	③				④					2	1					1					
	B.Man	④	③					④				2						1					
11 TRAIN. DATA	A St.	1																					
	B Man	1																					
12 OTHER (SPEC. IN Q 1.24)	A St.																						
	B Man																						

Table 13

GRID C = Collected now France

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	⑥	⑥	3	3	1	⑤	2	4	1	2	⑥	4	2	-	-	3	2	2	1	1	-	-
	B Man.	⑥	⑥	3	2	1	2	5	3	-	1	⑤	4	2	-	-	3	2	2	1	1	-	-
2 BENEF. DATA	A St.	⑥	⑤	-	-	-	3	2	1	-	-	1	1	1	-	-	1	1	-	-	-	1	-
	B Man	⑤	④	-	-	-	1	3	1	-	-	1	1	1	-	-	1	1	-	-	-	1	-
3 INTERNAL COMP. IDENT.	A St.	⑥	⑤	3	3	2	⑤	2	-	1	3	⑥	⑤	2	-	1	4	2	1	-	1	2	-
	B Man	⑥	⑤	3	3	2	2	-	-	-	2	⑤	⑤	2	-	-	4	2	1	-	1	2	-
4 EMPL. PERF. DATA	A St.	1	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
	B Man.	1																					
5 WAGE DET.	A St.	2	2	-	-	-	2	-	1	-	-	2	2	1	-	-	1	1	-	-	-	1	-
	B Man.	⑥	⑥	1	-	-	2	5	1	-	-	⑥	5	3	-	1	2	3	1	-	-	3	1
6 SALARY DET.	A St.	⑥	⑥	1	-	-	⑥	1	2	-	1	⑥	⑤	3	-	1	2	3	1	-	-	3	1
	B Man.	3	3	-	-	-	2	2	1	-	-	3	3	1	-	-	1	1	-	-	-	1	-
7 EDUC. DETAILS	A St.	④	-	1	2	-	-	-	2	1	1	1	1	-	-	2	1	-	1	-	-	-	-
	B Man.	2	-	1	2	-	-	-	1	-	-	-	-	-	-	1	1	-	1	-	-	-	-
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	3	1	1	-	-	1	-	-	-	1	2	2	-	1	-	1	-	-	-	-	-	-
	B Man	3	-	1	-	-	-	1	-	-	-	2	2	-	1	-	1	-	-	-	-	-	-
9 COMP.& BENEF. ADM.	A St.	3	2	-	-	-	3	2	-	-	1	2	2	1	-	-	-	1	-	-	-	1	-
	B Man	3	2	-	-	-	2	3	-	-	1	3	2	1	-	-	-	1	-	-	-	1	-
10 MAN-POW. COST (GROSS) DATA	A St	⑤	2	-	-	-	3	1	1	-	1	3	4	-	-	-	2	-	-	-	-	-	-
	B Man	⑤	2	-	-	-	1	3	1	-	1	3	④	-	-	-	2	-	-	-	-	-	-
11 TRAIN. DATA	A St.	3							1	1	1										1		
	B Man	2																					
12 OTHER (SPEC. IN Q 1.24)	A St.	2	1	2	-	1	1	-	1	-	1	2	1	-	-	-	1						1
	B Man	2	1	2	-	1	-	1	-	-	-	1	1	-	-	-	1						1

Table 14

G R I D C = Collected now Germany

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS		STAGE Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	⑤	⑤	④	1	-	⑤	3	1	2	2	2	1	2	1	2	1	2	2	2	1	1	-
	B Man	⑥	⑥	⑤	2	-	3	⑥	1	2	3	3	1	3	1	1	2	2	2	2	1	1	-
2 BENEF. DATA	A St.	3	2	3	-	-	3	1	-	1	1	-	-	2	-	-	-	1	1	-	-	-	-
	B Man	3	3	3	-	-	1	3	-	1	1	-	-	2	-	-	-	1	1	-	-	-	-
3 INTERNAL COMP. IDENT.	A St.	⑤	③	④	3	1	4	2	2	2	2	2	-	2	1	1	-	2	1	1	-	-	-
	B Man	⑤	③	④	3	1	2	④	2	2	3	3	-	2	1	1	-	2	1	1			
4 EMPL. PERF. DATA	A St.	1																					
	B Man	1																					
5 WAGE DET.	A St.																						
	B Man	④	④	-	-	1	1	④	1	-	1	2	1	2	-	-	-	1	1	-	1	1	-
6 SALARY DET.	A St.	⑤	⑤	-	-	2	⑤	2	2	1	2	2	1	2	-	1	-	2	2	-	1	1	-
	B Man	1	1	-	-	1	1	1	1	1	1	-	-	-	-	-	-	1	1	-	1	1	
7 EDUC. DETAILS	A St.	3					1	1				1											
	B Man	3					1	1				1											
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.																						
	B Man																						
9 COMP.& BENEF. ADM.	A St.	④	3	-	-	-	3	1	-	-	-	-	-	1	-	-	-	1	2	-	1	1	
	B Man	④	3	-	-	-	1	3	-	-	-	-	-	1	-	-	-	1	2	-	1	1	
10 MAN-POW. COST (GROSS) DATA	A St	⑥	2	-	-	-	⑤	3	-	-	-	-	-	-	1	-	1	1	1	-	1	1	
	B. Man	⑥	2	-	-	-	3	⑤	-	-	-	-	-	-	1	-	1	1	1	-	1	1	
11 TRAIN. DATA	A St.	2																					
	B Man	1																					
12 OTHER (SPEC. IN Q 1.24)	A St.	1	1	-	-	1	1	-	1	-	1	1	-	-	1	-	1	1	-	-	-	1	-
	B Man	2	1	-	-	1	-	1	1	-	1	1	-	-	1	-	1	1	-	-	-	1	-

Table 15

GRID C = Collected now Great Britain

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.PERSONAL IDENTIFICATION DATA	A St.	⑦	⑥	⑦	5	3	5	1	3	1	3	⑦	5	1	4	1	⑥	4	2	2	1	1	
	B Man	⑤	⑤	⑤	④	2	1	④	1		2	⑤	2	1	④		⑤	1	1	3	1	2	
2 BENEF. DATA	A St.	⑦	⑥	3	2	1	4	1	1	1	1	4	3	1	2	-	3	2	2	1			
	B Man	⑤	⑤	2			1	1				2	1										
3 INTERNAL COMP. IDENT.	A St.	⑦	⑥	⑦	⑥	2	5	2	3	1	3	⑦	4	1	4	1	⑥	4	2	1	1	1	
	B Man	5	⑤	⑤	⑤	1	1	④	1		2	⑤	1	2	4		⑤	1	1	2	2	2	
4 EMPL. PERF. DATA	A St.	1					1		1	1		1				1							
	B Man	1																					
5 WAGE DET.	A St.	1	1				1	1				1											
	B Man	⑤	⑤	2	1	1	1	④				④	1	3	1		1	1	1			2	
6 SALARY DET.	A St.	⑥	⑥	2	2	1	⑤	1	2		1	4	3	2	2	1	3	3	2	1		1	
	B Man	2	1	1			1	1				1											
7 EDUC. DETAILS	A St.	5	1	3	2	3	2		2		1	3	1	1	3	1	2	1	1	1	1	1	
	B Man	3	1	1	1	1		1				2			1		2	1		1			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	5	1	2	4	1	2		1		1		2		1	1	2	1			1	1	
	B Man	2		1	3	2	1				1		1		1		2	1			1	1	
9 COMP.& BENEF. ADM.	A St.	⑥	⑤				3	1				2	2		1		1		1			1	1
	B Man	⑤	4				1	1				1											1
10 MAN-POW. COST (GROSS) DATA	A St	⑥	⑤	2			4	1				4	1	2	2		1	3			1	1	
	B Man	⑤	⑤	2			1	3				3		2	1		1	3		1	1	1	
11 TRAIN. DATA	A St.	1		1	1							1			1		1			1			
	B Man	1		1	1			1				1			1					1			
12 OTHER (SPEC. IN Q 1.24)	A St.	3		1	1	1	1					2											
	B Man																						

Table 16

GRID C = Collected now Sweden

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	⑤	④	2	⑤	1	⑤	-	2	-	1	⑤	5	⑤	3	1	④	⑤	④	2	1	3	-
	B Man	⑤	④	2	⑤	1	-	⑤	2	-	1	④	5	4	2	-	③	④	4	1	-	1	-
2 BENEF. DATA	A St.	⑤	3	3	1	-	4	-	-	-	1	④	3	2	3	-	2	-	2	-	1	3	-
	B Man	⑤	2	2	1	-	-	4	-	-	1	3	2	1	3	-	2	-	2	-	1	2	-
3 INTERNAL COMP. IDENT.	A St.	⑤	3	④	④	2	3	1	-	-	3	⑤	1	⑤	3	-	2	2	1	1	1	2	-
	B Man	④	2	3	3	2	1	3	-	-	2	2	1	2	2	-	2	1	1	1	1	1	-
4 EMPL. PERF. DATA	A St.	1	1	1	-	-	1	-	-	-	1	1	1	1									
	B Man	2	1	1	-	1	-	1	-	-	1	1	1	1	1	-	1	-	-	1			
5 WAGE DET.	A St.	1	-	1	-	-	-	1	-	-	-	1	1	1									
	B Man	④	③	2	-	1	-	③	-	1	1	③	③	④	-	-	-	2	1	1	-	2	-
6 SALARY DET.	A St.	⑤	③	③	-	1	④	-	-	1	1	④	④	⑤	-	-	-	3	1	1	-	3	-
	B Man																						
7 EDUC. DETAILS	A St.	④	-	-	1	1	-	-	2	-	2	③	③	③	2	-	2	1	-	2			
	B Man	1	--	--	-	-	-	-	1	-	1	1	-	-	1	-	1						
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2	1	1	-	-	1	-	-	-	-	1	2	1	-	-	-	1					
	B Man	2	1	1	-	-	-	1	-	-	-	1	2	1									
9 COMP.& BENEF. ADM.	A St.	⑤	1	-	-	-	3	-	-	-	-	3	1	2	-	-	-	1	2	-	-	1	
	B Man	2	1	-	-	-	-	1	-	-	-	1	1	1	-	-	-	-	2				
10 MAN-POW. COST (GROSS) DATA	A St	⑤	④	④	1	-	⑤	-	-	-	-	⑤	3	1	-	-	-	1	-	-	1	2	-
	B Man	⑤	④	④	1	-	-	⑤	-	-	-	⑤	3	1	-	-	-	1	-	-	-	2	
11 TRAIN. DATA	A St.	3	-	-	-	1	1	-	2	-	1	1	-	-	1	-	1	1	-	1	-	-	-
	B Man	2	-	-	-	1	-	1	2	-	1	1	-	-	1	-	1	1	-	1			
12 OTHER (SPEC. IN Q 1.24)	A St.																						
	B Man																						

Table 17

GRID C = Collected now Switzerland

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS		STAGE Collected now	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	3	3	2	2	1	3	1	1	1	2	3	2	3	1		3	2	2		1	1	1
	B Man	2	2	1	2	1	1	2	1	1	2	2	1	2			2	1	1		1	1	
2 BENEF. DATA	A St.	2	2	2	1	1	2					2	1	2			2	2	2		1		
	B Man	1	1	1	1	1		1				1		1			1	1	1		1		
3 INTERNAL COMP. IDENT.	A St.	2	2	2	2	1	2		1	1	1	2	1	2			2	2	2		1		1
	B Man	1	1	1	1	1		1	1	1	1	1		1			1	1	1		1		
4 EMPL. PERF. DATA	A St.	1	1	1	1		1			1		1		1			1	1	1		1		
	B Man	1	1	1	1			1		1		1		1			1	1	1		1		
5 WAGE DET.	A St.	1	1	1	1	1	1					1		1			1	1	1				
	B Man	2	1	2	1	2		2				2	1	2		1	2	2	1		1		
6 SALARY DET.	A St.	3	2	3	1	2	2	1	1			3	2	3		1	3	3	2				
	B Man	1																					
7 EDUC. DETAILS	A St.																						
	B Man																						
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2	1	2	1	1	1	1				2	1	1			1	1	1				1
	B Man	1	1	1	1		1	1				1											
9 COMP.& BENEF. ADM.	A St.	2	2	2			2					2	1	1				1	1				1
	B Man	1	1	1				1				1											
10 MAN-POW. COST (GROSS) DATA	A St	3	3	2			3					2	1	2			1	1	1				
	B Man	2	2	1				2				2	1	1	1			1			1		
11 TRAIN. DATA	A St.																						
	B Man																						
12 OTHER (SPEC. IN Q 1.24)	A St.	2	1				1																
	B Man	1	1					1															

Comments on GRID D, i.e. stage - currently being developed:-

This stage shows almost the same pattern as grid C, but there is a strong tendency to record education details more than before, without any specific applications as regards output.

Table 18

GRID D = Currently being developed Total

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS		STAGE Currently being developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	18	9	8	8	4	8	1	6	4	5	6	5	9	7	2	6	6	4	5	1	2	-
	B Man	14	8	7	8	2	1	6	5	3	4	6	5	7	4	1	4	5	3	2	-	1	-
2 BENEF. DATA	A St.	11	6	3	2	2	7	-	5	2	-	4	6	1	4	2	3	1	2	3	3	2	-
	B Man	10	7	3	2	1	-	7	4	2	-	5	6	-	4	1	3	-	1	2	2	2	1
3 INTERNAL COMP. IDENT.	A St.	16	7	7	6	6	6	1	3	3	4	6	4	7	7	4	6	6	3	4	3	2	1
	B Man	13	7	7	6	2	1	5	2	2	4	5	5	6	4	2	4	5	2	2	2	1	1
4 EMPL. PERF. DATA	A St.	5	2	1	-	-	4	-	2	2	1	3	1	2	1	2	1	1	-	-	-	-	-
	B Man	5	2	1	-	-	1	3	2	2	1	3	1	2	1	1	1	1					
5 WAGE DET.	A St.	1	1	1																			1
	B Man	12	7	3	2	2	-	5	1	2	2	3	4	6	2	1	3	8	1	1	-	-	2
6 SALARY DET.	A St.	14	8	3	2	2	6	-	1	2	2	4	4	7	2	3	4	8	2	1	1	1	2
	[illegible]	3	1	1	1	-	-	1															1
7 EDUC. DETAILS	A St.	14	-	5	4	8	5	1	5	3	3	6	2	1	4	4	5	-	1	6			
	B Man	10	-	4	4	5	1	4	4	2	4	5	2	-	3	3	4	-	-	3			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	6	2	2	-	1	2	-	1	-	1	4	1	1	1	-	2	-	-	1			
	B Man	4	1	2	-	-	-	2	1	-	1	2	1	-	1	-	1						
9 COMP.& BENEF. ADM.	A St.	8	6	-	-	-	5	-	-	-	-	4	3	3	-	-	1	5	3				
	B Man	7	6	-	-	-	-	5	-	-	-	5	3	2	-	-	1	4	2				
10 MAN-POW. COST (GROSS) DATA	A St	9	6	-	-	-	4	-	-	-	-	4	3	2	2	1	2	6	2	1	1	1	1
	B. Man	8	6	-	-	-	-	4	-	-	-	4	3	1	2	1	1	5	1	-	-	1	1
11 TRAIN. DATA	A St.	8	-	1	1	3	2	-	3	1	2	4	2	-	1	2	-	2	-	3			
	B Man	7	-	1	1	3	-	2	3	1	2	3	2	-	1	2	-	2	-	4			
12 OTHER (SPEC. IN Q 1.24)	A St.	3	1	-	1	-	2	-	-	1	-	-	-	-	2	2	2	2	-	2	-	1	-
	B Man	1	1	-	1	-	-	1										1					

Table 19

GRID D = Currently being developed Austria

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS		STAGE: Currently being developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	2	1																				
	B Man	2	1																				
2 BENEF. DATA	A St.																						
	B Man																						
3 INTERNAL COMP. IDENT.	A St.	1																					
	B Man	1																					
4 EMPL. PERF. DATA	A St.																						
	B Man																						
5 WAGE DET.	A St.																						
	B Man	1																					
6 SALARY DET.	A St.	1																					
	B Man																						
7 EDUC. DETAILS	A St.																						
	B Man																						
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.																						
	B Man																						
9 COMP.& BENEF. ADM.	A St.	1	1															1					
	B Man	1	1															1					
10 MAN-POW. COST (GROSS) DATA	A St	1	1												1								
	B.Man	1	1												1								
11 TRAIN. DATA	A St.																						
	B Man																						
12 OTHER (SPEC. IN Q 1.24)	A St.																						
	B Man																						

Table 20

GRID D = Currently being developed France

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Currently being developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	4	2	2	1	-	1	-	1	-	-	1	-	1	1	2	-	1	-	1	-	1	
	B Man	3	2	2	1	-	-	1	1	-	-	1	-	1	-	1	-	1					
2 BENEF. DATA	A St.	2	2	1	-	-	1	-	1	-	-	1	-	-	-	1							1
	B Man	2	2	1	-	-	-	1	1	-	-	1	-	-	-	1							1
3 INTERNAL COMP. IDENT.	A St.	4	2	2	1	1	1	-	1	-	-	1	-	1	1	2	-	1	-	1	-	1	1
	B Man	3	2	2	1	-	-	1	1	-	-	1	-	1	-	1	-	1					1
4 EMPL. PERF. DATA	A St.	1																1					
	B Man	1																					
5 WAGE DET.	A St.	1	1	1																			1
	B Man	4	2	1	1	-	-	1	-	-	-	-	-	1	-	-	-	1					2
6 SALARY DET.	A St.	4	2	1	1	-	1							1	-	1	-	1				1	2
	B Man	2	1	1	1																		1
7 EDUC. DETAILS	A St.	4	-	1	-	3						1	-	-	-	2							
	B Man	2	-	1	-	2						1				1							
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2	2	1	-	-	1					1	1										
	B Man	2	1	1	-	-	-	1					1										
9 COMP.& BENEF. ADM.	A St.	2	2	-	-	-	1					1	1										
	B Man	2	2					1				2	1										
10 MAN-POW. COST (GROSS) DATA	A St	2	2				1					1				1							1
	B. Man	2	2					1				1				1							1
11 TRAIN. DATA	A St.	2										1				1							
	B Man	1																					
12 OTHER (SPEC. IN Q 1.24)	A St.	1	1	-	1	-	1									1	-	1	-	1	-	1	
	B Man	1	1	-	1	-	-	1										1					

Table 21

GRID D = Currently being developed Germany

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Currently being developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	8	5	5	6	2	5	1	3	3	5	4	4	5	4	-	4	3	2	3			
	B Man	7	4	4	5	1	1	4	3	3	4	4	4	4	3	-	3	3	2	2			
2 BENEF. DATA	A St.	7	3	1	1	1	5	-	3	2	-	2	5	-	3	-	2	-	-	2	1	1	
	B Man	7	4	1	1	1	-	5	3	2	-	3	5	-	3	-	2	-	-	2	1	1	
3 INTERNAL COMP. IDENT.	A St.	7	4	4	4	2	3	-	1	2	3	4	4	3	4	2	4	4	3	2	1	1	
	B Man	7	4	4	4	1	-	3	1	2	3	4	4	3	3	1	3	4	2	2	1	1	
4 EMPL. PERF. DATA	A St.	3	1	-	-	-	3	-	2	2	1	2	-	1	1	1	1	1					
	B Man	3	1	-	-	-	1	2	2	2	1	2	-	1	1	1	1	1					
5 WAGE DET.	A St.																1	1					
	B Man	6	5	2	1	1	-	4	1	1	2	3	4	5	2	1	3	6	1				
6 SALARY DET.	A St.	7	5	2	1	1	5	-	1	1	2	3	4	4	2	2	3	5	1				
	B Man	1						1															
7 EDUC. DETAILS	A St.	6	-	3	3	2	4	1	3	2	3	4	1	-	4	2	4	-	-	4			
	B Man	6	-	3	4	2	1	4	3	2	4	4	1	-	3	2	4	-	-	2			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2	-	1	-	-	1	-	1	-	1	2	-	-	1	-	1						
	B Man	2	-	1	-	-	-	1	1	-	1	2	-	-	1	-	1						
9 COMP.& BENEF. ADM.	A St.	3	2	-	-	-	3	-	-	-	-	2	1	1	-	-	1	3	1				
	B Man	3	2	-	-	-	-	3	-	-	-	2	1	1	-	-	1	3	1				
10 MAN-POW. COST (GROSS) DATA	A St	4	2	-	-	-	2	-	-	-	-	2	2	1	1	-	1	4	1				
	B Man	4	2	-	-	-	-	2	-	-	-	2	2	1	1	-	1	4	1				
11 TRAIN. DATA	A St.	4	-	1	1	2	1	-	2	1	2	3	2	-	1	1	-	1	-	2			
	B Man	4	-	1	1	2	-	1	2	1	2	3	2	-	1	2	1	1	-	3			
12 OTHER (SPEC. IN Q 1.24)	A St.	1														1	1	1		1			
	B Man																						

Table 22

GRID D = Currently being developed Great Britain

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Currently being developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	3			1	2	1		1	1				2	1		1	1	1	1	1		
	B Man	1			1	1								1									
2 BENEF. DATA	A St.	1				1			1					1				1	1	1	1		
	B Man																						
3 INTERNAL COMP. IDENT.	A St.	3				3	1		1	1				2	1		1	1	1	1	1		
	B Man	1				1								1									
4 EMPL. PERF. DATA	A St.																						
	B Man																						
5 WAGE DET.	A St.																						
	B Man																						
6 SALARY DET.	A St.	1										1		1			1	1	1		1		
	B Man																						
7 EDUC. DETAILS	A St.	3		1	1	2	1		1	1		1	1	1			1		1	2			
	B Man	1																		1			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2				1						1		1			1			1			
	B Man																						
9 COMP.& BENEF. ADM.	A St.	1												1				1	1				
	B Man																						
10 MAN-POW. COST (GROSS) DATA	A St	1												1			1	1	1	1	1		
	B Man																						
11 TRAIN. DATA	A St.	1																		1			
	B Man	1																		1			
12 OTHER (SPEC. IN Q 1.24)	A St.	1					1			1					1		1						
	B Man																						

Table 23

GRID D = Currently being developed Sweden

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		STAGE	OUTPUT - USE OF INPUTS																				
INPUT ITEMS		Currently being Developed	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	1	1	1	1	-	1	-	1	-	-	1	1	1	-	-	-	-	1	-	-	1	
	B Man	1	1	1	1	-	-	1	1	-	-	1	1	1	-	-	-	-	1	-	-	1	
2 BENEF. DATA	A St.	1	1	1	1	-	1	-	-	-	-	1	1	-	-	-	-	-	1	-	1	1	
	B Man	1	1	1	1	-	-	1	-	-	-	1	1	-	-	-	-	-	-	1	1	1	
3 INTERNAL COMP. IDENT.	A St.	1	1	1	1	-	1	1	-	-	1	1	-	1	1	-	1	-	-	-	1		
	B Man	1	1	1	1	-	1	1	-	-	1	-	1	1	1	-	1	-	-	-	1		
4 EMPL. PERF. DATA	A St.	1	1	1	-	-	1	-	-	-	-	1	1	1									
	B Man	1	1	1	-	-	-	1	-	-	-	1	1	1									
5 WAGE DET.	A St.																						
	B Man	1				1				1				1				1		1			
6 SALARY DET.	A St.	1				1				1				1				1		1			
	B Man																						
7 EDUC. DETAILS	A St.	1				1			1														
	B Man	1				1			1														
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.																						
	B Man																						
9 COMP.& BENEF. ADM.	A St.	1	1				1					1	1	1					1				
	B Man	1	1					1				1	1	1					1				
10 MAN-POW. COST (GROSS) DATA	A St	1	1				1					1	1					1				1	
	B.Man	1	1					1				1	1					1				1	
11 TRAIN. DATA	A St.	1				1	1		1									1					
	B Man	1				1		1	1									1					
12 OTHER (SPEC. IN Q 1.24)	A St.																						
	B Man																						

Comments on GRID E, i.e. stage - planned for future :-

This stage also shows a pattern over the boundary-lines and in this case there is a tendency to record employee performance data and education details together with training data, with an apparent emphasis on staff employees.

The significant application areas of these data seem to be promotion, appraisal, transfer and manpower planning, management and career development and training.

Table 24

GRID E = Planned for future Total

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

INPUT ITEMS	STAGE	Planned for future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St	17	-	1	4	4	1	-	5	11	6	2	4	2	10	11	6	3	7	11	4	2	1
	B Man	12	-	1	4	4	-	1	4	6	5	2	3	2	6	5	4	3	7	7	3	1	-
2 BENEF. DATA	A St	12	-	1	2	3	-	-	1	4	3	3	2	3	6	5	6	3	1	2	-	1	-
	B Man	10	-	1	2	3	-	1	1	2	3	2	1	3	4	2	4	2	1	1	-	-	-
3 INTERNAL COMP. IDENT.	A St.	16	-	1	5	3	1	-	7	10	5	2	1	2	10	11	6	6	2	8	1	2	1
	B Man	11	-	1	5	3	-	1	5	5	3	2	1	2	4	3	4	5	2	6	1	1	-
4 EMPL. PERF. DATA	A St.	20	-	1	1	3	4	1	12	13	7	5	-	-	7	11	4	-	1	9	2	2	-
	B Man	10	-	-	-	1	1	2	6	6	5	2	-	-	3	2	2	-	1	2	1	1	-
5 WAGE DET.	A St.	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1	-	-	1	-	-	-
	B Man	7	-	-	1	2	-	1	2	-	2	1	-	3	3	1	5	1	2	1	1	-	-
6 SALARY DET.	A St.	10	-	1	1	3	1	-	2	3	2	3	-	3	5	5	6	1	2	2	1	1	1
	B Man	1										1		1			1						
7 EDUC. DETAILS	A St.	20	-	4	4	7	1	-	9	13	11	6	4	3	11	14	7	4	1	12	3	2	-
	B Man.	13	-	4	3	6	-	1	7	7	8	5	4	3	6	4	5	2	1	6	2	1	-
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	6	-	-	-	1	-	-	1	-	-	-	1	-	2	2	2	-	1	-	-	1	-
	B Man	3	-	-	-	1	-	-	1	-	-	-	1	-	1	-	2	-	1	-	-	-	-
9 COMP.& BENEF. ADM.	A St.	8	-	1	1	2	-	-	3	2	1	2	-	1	2	2	1	3	2	1	-	1	-
	B Man	7	-	-	-	1	-	-	3	2	1	1	-	1	1	1	-	3	2	1	-	-	-
10 MAN-POW. COST (GROSS) DATA	A St	9	2	-	1	-	-	-	-	-	-	1	-	3	4	1	-	4	1	-	2	2	-
	B Man	8	2	-										3	3	-	-	4	1	-	2	1	
11 TRAIN. DATA	A St.	23	-	4	3	5	2	-	11	9	11	8	3	-	12	10	7	3	2	14	3	3	-
	B Man	15	-	3	2	3	-	1	8	6	9	6	2	-	8	4	7	1	1	9	2	1	-
12 OTHER (SPEC. IN Q 1.24)	A St.	7	-	1	1	2	-	-	3	1	2	3	1	-	5	3	3	2	1	2	1	3	1
	B Man	2	-	-	-	1	-	-	1	-	1	2	-	-	1	-	2	1	-	-	1	1	-

Table 25

GRID E = planned for future Austria

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT		OUTPUT - USE OF INPUTS																					
INPUT ITEMS	STAGE	Planned for future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1.PERSONAL IDENTIFICATION DATA	A St.	1														1			1	1	1		
	B Man	1																	1	1	1		
2 BENEF. DATA	A St.																						
	B Man																						
3 INTERNAL COMP. IDENT.	A St.	1							1							1							
	B Man	1							1														
4 EMPL. PERF. DATA	A St.	2									1					1							
	B Man	2									1												
5 WAGE DET.	A St.																						
	B Man																						
6 SALARY DET.	A St.																						
	B Man																						
7 EDUC. DETAILS	A St.	2							1		1					1							
	B Man	1							1		1												
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.																						
	B Man																						
9 COMP.& BENEF. ADM.	A St.	1																					
	B Man	1																					
10 MAN-POW. COST (GROSS) DATA	A St																						
	B Man																						
11 TRAIN. DATA	A St.	2													1								
	B Man	2													1								
12 OTHER (SPEC. IN Q 1.24)	A St.																						
	B Man																						

Table 26

GRID E = planned for future France

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS	STAGE	Planned for future E	Payroll 1	Headcount 2	Labour Turnover/ Stability 3	Recruitment 4	Salary Administration 5	Wage Administration 6	Promotion 7	Appraisal 8	Transfer 9	Internal Labour Statistics 10	External Labour Statistics 11	Wage/Salary Negotiation 12	Manpower Planning 13	Management & Career Development 14	Manpower Analysis 15	Personnel Planning (Budgets) 16	Welfare Services 17	Training 18	Productivity Measurement 19	Manpower Economics 20	Other (Spec. in Q 1.24) 21
1. PERSONAL IDENTIFICATION DATA	A St	⑤			2	1			1	3	2		2	1	4	2	2	1	2	3			1
	B Man	3			2	1			1	3	2		1	1	2	1	1	1	2	2			
2 BENEF. DATA	A St.	2								1	1	1	2	1	1		2	1					
	B Man	1								1	1		1	1	1		1	1					
3 INTERNAL COMP. IDENT.	A St.	⑥			2	1			1	3	2		1	1	4	2	2	2	1	2			1
	B Man	4			2	1			1	3	2		1	1	2	1	1	2		2			
4 EMPL. PERF. DATA	A St.	2					1	1	2	1		1			1	1				1			
	B Man	1					1	1	1	1		1											
5 WAGE DET.	A St.	2										1		1			1			1			
	B Man	2										1		1			1		1				
6 SALARY DET.	A St.	3										1		1			2		1	1			1
	B Man	1										1		1			1						
7 EDUC. DETAILS	A St.	5			1				2	2	2	2	1	1	3	2				3			
	B Man	3			1				1	2	2	2	2	1	2	1				1			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2																					
	B Man	1																					
9 COMP.& BENEF. ADM.	A St.	2							1	1													
	B Man	1							1	1													
10 MAN-POW. COST (GROSS) DATA	A St	3												2				1					
	B Man	3												2				1					
11 TRAIN. DATA	A St.	⑥							3	2	2	1			2	2		1		4	1	1	
	B Man	④							2	2	2				1	1				2			
12 OTHER (SPEC. IN Q 1.24)	A St.	2							1				1		2	1		1		1		1	1
	B Man																						

Table 27

G R I D E = planned for future Germany

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT	STAGE	OUTPUT - USE OF INPUTS																					
INPUT ITEMS		Planned for future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	4		1	2	3			2	3	2	2	1	1	2	3	2	1	2	3	1		
	B Man	4		1	2	3			2	2	2	2	1	1	1	2	2	1	2	2	1		
2 BENEF. DATA	A St.	4		1	2	3			1	1	1	1		2	3	3	2	1		2			
	B Man	4		1	2	3			1		1	1		2	2	2	2	1		1			
3 INTERNAL COMP. IDEN..	A St.	3		1	3	2			2	2	1	2		1	3	3	3	2	1	3			
	B Man	3		1	3	2			2	1	1	2		1	2	2	3	2	1	2			
4 EMPL. PERF. DATA	A St.	⑥				1	1		④	⑤	④	1			2	④	2		1	③	1	1	
	B Man	⑤				1		1	④	④	④	1			2	2	2		1	2	1	1	
5 WAGE DET.	A St.																						
	B Man	4			1	2			2	2	2			2	3	1	4	1	1	1	1		
6 SALARY DET.	A St.	4		1	1	2			2	2	2	2		2	4	3	4	1	1	1	1		
	B Man																						
7 EDUC. DETAILS	A St.	4		3	2	3			3	4	3	2	1	2	3	4	4	1	1	4	2	1	
	B Man	4		3	2	3			3	3	3	2	1	2	3	2	4	1	1	3	2	1	
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	1											1		1	1	1		1				
	B Man	1											1		1		1		1				
9 COMP.& BENEF. ADM.	A St.	4				1			2	1	1	1		1	1	1		3	2	1			
	B Man	4				1			2	1	1	1		1	1	1		3	2	1			
10 MAN-POW. COST (GROSS) DATA	A St	3	1											1	2			3	1		1		
	B Man	3	1											1	2			3	1		1		
11 TRAIN. DATA	A St.	⑦		3	2	4	1	-	5	4	5	4	2	-	3	4	4	1	1	⑥	2	1	-
	B Man	⑥		3	ü	3	-	1	5	4	5	4	2	-	5	3	5	1	1	⑥	2	1	
12 OTHER (SPEC. IN Q 1.24)	A St.	2				1		-	1		1	1			2	1	1	1				1	
	B Man	1				1			1		1	1			1		1	1				1	

Table 28

GRID E = planned for future Great Britain

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

INPUT ITEMS	STAGE	Planned for future	OUTPUT USE OF INPUTS Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.		E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.	4					1		1	3	1		1		1	3			1	2	2	2	
	B Man	1						1	1				1			1			1	1	1	1	
2 BENEF. DATA	A St.	3								2	1	1			1	2						1	
	B Man	2								1	1	1											
3 INTERNAL COMP. IDENT.	A St.	4					1		1	3	1				1	3			1	2	1	2	
	B Man	2						1	1	1									1	1	1	1	
4 EMPL. PERF. DATA	A St.	⑥		1	1	1	2		3	4	1	2			1	3	1			3	1	1	
	B Man																						
5 WAGE DET.	A St.																						
	B Man	1						1															
6 SALARY DET.	A St.	3				1	1			1					1	2						1	
	B Man																						
7 EDUC. DETAILS	A St.	4		1		1	1		1	3	1		1		1	3	1			2	1	1	
	B Man	1		1		1		1	1								1			1			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.	2				1			1						1	1	1					1	
	B Man	1				1			1								1						
9 COMP.& BENEF. ADM.	A St.	1		1	1	1						1			1	1	1					1	
	B Man																						
10 MAN-POW. COST (GROSS) DATA	A St	2	1		1							1			2	1					1	2	
	B Man	1	1												1						1	1	
11 TRAIN. DATA	A St.	4		1	1	1	1		2	2	2	2	1		2	2	2	1	1	2	1	1	
	B Man	1							1		1	1			1		1			1			
12 OTHER (SPEC. IN Q 1.24)	A St.	2		1	1	1			1	1	1	2			1	1	2		1	1	1	1	
	B Man	1										1					1				1		

Table 29

GRID E = planned for future Sweden

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT			OUTPUT - USE OF INPUTS																					
INPUT ITEMS		STAGE	Planned for future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.			E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. PERSONAL IDENTIFICATION DATA	A St.		3							1	2	1				3	2	2	1	1	2			
	B Man		3								1	1				3	1	1	1	1	1			
2 BENEF. DATA	A St.		2													1		2	1					
	B Man		2						1							1		1						
3 INTERNAL COMP. IDENT.	A St.		2							2	2	1				2	2	1	2		1			
	B Man		1																1		1			
4 EMPL. PERF. DATA	A St.		2							1	1					1	1				1			
	B Man		1																					
5 WAGE DET.	A St.																							
	B Man																							
6 SALARY DET.	A St.																							
	B Man																							
7 EDUC. DETAILS	A St.		2			1	1				1	1				2	2	1	2		1			
	B Man		2				1																	
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.		1																					
	B Man																							
9 COMP.& BENEF. ADM.	A St.																							
	B Man		1																					
10 MAN-POW. COST (GROSS) DATA	A St																							
	B Man																							
11 TRAIN. DATA	A St.		2													1	1				1			
	B Man		1																					
12 OTHER (SPEC. IN Q 1.24)	A St.																							
	B Man																							

Table 30

GRID

E = planned for future

Switzerland

ITEMS OF DATA COLLECTED AND RECORDED (INPUT) STAGE OF DEVELOPMENT

OUTPUT - USE OF INPUTS

INPUT ITEMS		STAGE	Planned for future	Payroll	Headcount	Labour Turnover/ Stability	Recruitment	Salary Administration	Wage Administration	Promotion	Appraisal	Transfer	Internal Labour Statistics	External Labour Statistics	Wage/Salary Negotiation	Manpower Planning	Management & Career Development	Manpower Analysis	Personnel Planning (Budgets)	Welfare Services	Training	Productivity Measurement	Manpower Economics	Other (Spec. in Q 1.24)
LINE NO.			E	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
.PERSONAL IDENTIFICATION DATA	A St.																							
	B Man																							
2 BENEF. DATA	A St.		1																	1				
	B Man		1																	1				
3 INTERNAL COMP. IDENT.	A St.																							
	B Man																							
4 EMPL. PERF. DATA	A St.		2				1			2	2	1	1			2	1	1			1			
	B Man		1							1	1					1								
5 WAGE DET.	A St.																							
	B Man																							
6 SALARY DET.	A St.																							
	B Man																							
7 EDUC. DETAILS	A St.		③				2			②	③	③	2	1		2	2	1	1		2			
	B Man		②				1			①	②	②	1	1		1	1		1		1			
8 EXTRA-FIRM DATA (SPECIFY IN Q 1.24)	A St.																							
	B Man																							
9 COMP.& BENEF. ADM.	A St.																							
	B Man																							
10 MAN-POW. COST (GROSS) DATA	A St																							
	B.Man																							
11 TRAIN. DATA	A St.		2				1			1	1	2	1			1	1	1			1			
	B Man		1									1	1											
12 OTHER (SPEC. IN Q 1.24)	A St.		1																					
	B Man																							

1.3 Integration of the EDP Personnel System to other functions EDP systems.

TABLE 31. (Q.1.12)

INPUT TO PERSONNEL SYSTEM FROM FUNCTION		A	F	G	GB	S	SZ	tot	OUTPUT TO OTHER SYSTEMS TO FUNCTION		A	F	G	GB	S	SZ	tot
FINANCE	Yes	2	-	1	1	-	2	6	FINANCE	Yes	3	7	8	5	5	3	31
	No	2	5	7	5	5	1	25		No	1	-	2	2	-	-	5
MARKETING	Yes	1	-	1	-	1	1	4	MARKETING	Yes	1	-	2	1	1	1	6
	No	3	5	7	5	4	2	26		No	3	5	6	4	4	2	24
PRODUCION	Yes	2	-	3	-	2	2	9	PRODUCTION	Yes	2	-	2	2	2	3	11
	No	1	5	5	5	3	1	20		No	1	5	6	3	3	-	18
TECHNICAL	Yes	2	-	-	-	1	-	3	TECHNICAL	Yes	2	-	-	2	-	-	4
	No	2	5	8	5	4	3	27		No	2	5	8	3	5	3	26
MANAGEMENT SERVICES	Yes	3	-	1	-	1	1	6	MANAGEMENT SERVICES	Yes	3	1	3	-	2	3	12
	No	1	3	7	4	4	2	23		No	1	5	5	4	3	-	18
OTHER (specify)	Yes	-	1	1	-	-	-	2	OTHER (specify)	Yes	-	1	2	2	-	-	5
	No	1		3	4	4	1	16		No	1	3	-	3	4	-	11

Comments on table 31

The only obvious connection to other functional EDP systems is that the output of the personnel data system is generally input in the finance function.

1.4 Systems configurations

TABLE 32. (Q.1.13 - 1.20)

Question 1.13 - 1.20			A	F	G	GB	S	SZ	Total
1.13	Does your company own its own computer?	Yes	4	6	10	8	5	3	36
		No							
1.14	If YES to question 1.13, do you use the computer wholly for personnel use?	Yes		2			1		3
		No	4	4	10	8	4	3	33
1.15	If NO to question 1.13, do you rely wholly upon an outside bureau?	Yes							
		No		1		x)			1
1.16	If NO to question 1.13, do you share a computer with another company or companies exlusively? e g joint purchase, leasing.	Yes							
		No		1		x)			1
1.17	Did your company develop your system?	Yes	4	8	10	9	5	3	39
		No							
1.18	If you are a part of a larger company or group of companies, do you provide data to the parent or head office? And do you also get feedback from that controlling unit?	Yes	2	1	4	2	1		10
		No	1	1	2	1	1	3	9
1.20	If you are the parent or head office of a larger company or group of companies, do you receive (and feed back) data from your branches, divisions or subsidiaries?	Yes	1	5	6	7	2	1	22
		No		1	2		1	2	6

x) Unanswered

1.5 Constraints and influences from external agencies on the design of the EDP system.

TABLE 33 (Q 1.21 - 1.23)

Question 1.21 - 1.23		A	F	G	GB	S	SZ	Total
1.21[x)] Did the local labour market have any influence on the design?	Yes	1	1	2	2	2	2	10
	No	3	5	7	7	3	1	26
1.22[x)] Did governmental legislation have any influence on the design and/or use of the system?	Yes	3	5	3	3	4	2	20
	No	1	1	6	6	1	1	16
1.23 Could you please give an indication here if the geographic area of your location is considered to be a development area by your government?	Yes		1		1	2		4
	No	3	3	9	7	2	3	27

x) Two companies have left these questions unanswered.

1.6 Further comments

TABLE 34 Survey of the general motivation(s) for applying EDP in the personnel area. (Q 1.24)

General motivations	A	F	G	GB	S	SZ	Σ
1. Swiftness, reliability, information system	2	1	4	5	2	3	17
2. Work reduction, rationalization	2	1	8	5		1	17
3. Reporting, legislation, statistics	2	3		2	2	2	11
4. Profit, i e reduced costs		1			3		4
5. Planning, steering		2	2	3	1	1	9
6. Coordination at fusions				1	1		2
							60

Eight companies have not answered this question.

This is a schematic illustration of general motivations from the companies for applying EDP in the personnel area and we think that this question is answered with greater accuracy in the case-studies.

Appendix 1

Statistical Analysis of "Use of EDP in Manpower". Questionnaire

1. The Basic Principles and Hypotheses*

All the analyses are based upon the Grid in the questionnaire, which records those items of data collected and recorded (input items), the use that is made of the data (output items), and the stage of development. It was deemed that data already being collected had three times the significance of data currently being developed, which, in turn, was deemed to have twice the significance of any item of data whose collection was "planned for the future". Therefore each 'C' on the grid was scored 6 points, each 'D' 2 points, and each 'E' 1 point. No response was scored zero.

By summing the 21 columns, 21 numbers were obtained, which are indicative of the rigorousness with which the company uses input data - i.e. 21 measures of rigorousness of output. Similarly, the sums of the rows give 24 measures of the rigorousness of the inputs to the EDP system. It will be seen that the maximum score for each of the output measures (X_1 to X_{21}) is 6 x 24 = 144, and the maximum score for each of the input measures (Y_{iA}- Y_{12A}, and Y_{1b} to Y_{1B}) is 6 x 21 = 126.

Furthermore, perusal of the questionnaire revealed that the distribution of scores in each of the 21 columns tended to fall into distinct patterns. Three such patterns, were discernible, and in order to quantify these patterns, three subtotals of columns were calculated. These subtotals wer:

α Subtotal: $Y_{1A}, Y_{1B}, Y_{2A}, Y_{2B}, Y_{5A}, Y_{5B}, Y_{6A}, Y_{6B}, Y_{9A}, Y_{9B}$

β Subtotal: $Y_{1A}, Y_{1B}, Y_{3A}, Y_{3B}, Y_{4A}, Y_{4B}, Y_{7A}, Y_{7B}, Y_{10A}, Y_{10B}, Y_{11A}, Y_{11B}$,

γ Subtotal: $Y_{1A}, Y_{1B}, Y_{4A}, Y_{4B}, Y_{6A}, Y_{6B}, Y_{8A}, Y_{8B}$

Since there are 21 columns, with three subtotals for each column, this gives a total of 3 x 21 = 63 subtotals, labelled $X_{1\alpha}$, $X_{1\beta}$, $X_{1\gamma}$, $X_{2\alpha}$ ....$X_{21\gamma}$

Thus the grid in each questionnaire was described by a total of 21 output measures + 24 input measures + 63 subtotal output measures.

* Based on the first 35 responses.

108 measures of the Grid. Additionally seven independent variables, describing the company itself were used in the analysis. Each of these seven independent variables were subdivided into groups or ranges, as follows :

i)	Country	6 countries
ii)	Level of Organisation	10 groupings
iii)	Section of Industry	6 groupings
iv)	Size (Manuals)	7 ranges
v)	Size (Staff)	7 ranges
vi)	Ownership (State/Private)	2 groupings
vii)	Age of EDP system (Years)	56 ranges

The hypothesis underlying the statistical analysis was that if the 35 questionnaires were sorted into the different ranges or groupings in any one of the 7 independent variables listed above, there would be similarities within each group or range, but dissimilarities between each group or range of anyone of the 7 independent variables. For example, it was thought that the score for column X_1 (use of input to achieve Payroll circulation output) might have similar values for each of the companies in Great Britain, and similar values for each of the companies in France, but that there would be a dissimilarity between typical scores for Great Britain, and typical scores for France; likewise with the other countries. It will be appreciated that with 7 independent variables, divisible into ranges or groupings, and with 108 measures of the grid for each of the questionnaires there is a possible total of 7 x 108 = 756 different situations in which the similarities within each group or range could be greater or less than the similarities between each group or range. The statistical techniques whereby the hypotheses were tested is explained in the next section (which may therefore be disregarded by those interested only in the principles and results of the analysis).

2. Statistical Techniques Used

The measure of the similarity within or between groupings which was chosen for the statistical analysis was the Variance: If the measure of the grid in any particular questionnaire is known as x (e.g. x = value of X_1, in respect of "Output of Payroll Data").

n = Total number of questionnaires (i.e. 35)
m = Number of groupings (e.g. 86 in respect of country)
ti = Sum of x's in a grouping
ni = Number of questionnaires in a grouping

N.B. For mathematical formula, see page 260.

The measure which compares the relationship between the similarity within groupings and the dissimilarity between groupings is known as the Variance Ratio. It is defined as the quotient

$$\frac{\text{Variance between groups}}{\text{Variance within group}}$$

It was used to test the hypotheses in the following manner: If random numbers are grouped randomly, the variance ratio can be calculated from the variance between and within these random groups. If this exercise is carried out a large number of times, it will be found that the variance ratio occupies a range of values. If the degree of freedom of the numerator is defined as in m-1 (using the previous notation) and the degree of freedom of the denominator is defined as n-m (using the previous notation), it will be found that for given values these degrees of freedom of numerator and denominator, a certain percentage of the randomly calculated degrees of freedom will exceed a certain numerical value. If this percentage is 5%, then the numerical value is known as $F_{.05}$ for differing degrees of freedom of numerator and denominator.

Returning to the data deduced from the EDP questionnaire, it can be seen that a Variance Ratio can be calculated in respect of each the 108 measures describing the grid, for each of the 7 (grouped) independent variables, e.g. The Variance Ratio of X_1 (output of payroll data) grouped by Country. If this Variance Ratio is greater than $F_{.05}$ for the same degrees of freedom of numerator and denominator, then there is a 95% probability that the variance within groups is significantly less than the variance between groups. Thus if the variance ratio quoted in the example in this paragraph were greater than the approximate $F_{.05}$, there would exist a correlation between Output of Payroll Data and Country.

3. Results of the Statistical Analysis

The statistical tests described above were carried out and their results are set out in the following tables. Those results which indicate that the similarity within group was significantly higher than the similarity between groups are underlined (for instance there exists a correlation between Country and Output of Internal Labour Statistics). This means that, for the circled numbers, the (grouped) independent variables have a significant effect upon the variable pertaining to the grid (i.e. Totals or subtotals of Input or Output items).

In fact it did not prove necessary to find the variance ratio of all 108 "Grid Descriptors" for each of the 7 (grouped) independent variables. For 45 Input and Output Totals, the variance ratio was found for all 7 independent variables (except that for obvious reasons Y_{1A} to Y_{12A} (staff input items) were not compared with the size of firm (manuals), and Y_{1B} to Y_{12B} (manual input items) were not compared with size of firm (staff). For the 63 subtotals (X_1 to X_{21}), perusal of the Totals indicated that it would only be necessary to calculate the variance ratios for Country and Section of Industry. The "Output-use of Input" measures (X_1 to X_{21}) are summarised in table 1, the "Input Items" measures (Y_{1A} to Y

Y_{1B} to Y_{12B}) in table 2, and the subtotals ($X_{1\alpha}$ to $X_{21\alpha}$, $X_{1\beta}$ to $X'_{21\beta}$, $X_{1\gamma}$ to $X_{21\gamma}$) are summarised in table 3.

Mathematical Formula

then the Variance between groups

$$= \frac{\sum_{i=1}^{i=m}\left[\frac{(t_i)^2}{n_i}\right] - \frac{\left(\sum_{i=1}^{i=m} X_i\right)^2}{n}}{m-1}$$

and the Variance within groups

$$= \frac{\sum_{i=1}^{i=m}\left(X_i^2\right) - \sum_{i=1}^{i=m}\left[\frac{(t_i)^2}{n_i}\right]}{n-m}$$

$\sum_{i=1}^{i=m} (a)$ means the sum of (a) for each of the groupings.

Use of EDP Questionnaire

Situations where the variance within groups is less than the variance between groups at the .05 level. This means that there is a correlation between column 1 and column 2 which has a probability of less than 5% of accuring naturally. e.g. in the first column it is at least 95% likely that Country has a significant effect upon the Output of Labour Statistics in a company.

Name of Group (Independent Variable)	Name of Input/Output Variable (Dependent Variable)
Country	Output of Labour Statistics (Internal)
"	Output on Labour Statistics (External
"	Output of Wage/Salary Negotiations
"	Input of Staff Wage Details
"	Input of Manuals Employee Performance Data
"	Input of Manuals Training Data
Level of Organisation	Output of Labour Internal Transfer Statistics
" "	Input of Manuals Compensation & Benefit Administration
" "	Input of Staff Training Data
Size of Firm (Manuals)	Input of Manuals Education Data
Size of Firm (Staff)	Output Recruitments
" " "	Output Appraisal
" " "	Output Management and Career Development
" " "	Input Staff Employee performance Data
Age of EDP System	Output Welfare Services
" " " "	Input Staff Internal Company Identification
" " " "	Input Staff Salary details
Ownership	Output Internal Labour Statistics

TABLE 1: VARIANCE RATIOS: "OUTPUT - USE OF INPUT" MEASURES

	INDEPENDENT (GROUPED) VARIABLES						
Name of Measure	Country	Section of Industry	Level of Organisation	Size of Firm (Manuals)	Size of Firm (Staff)	Age of EDP System	State/ Private Ownership
F.05	2.54	2.54	2.32	2.54	2.44	2.69	4.14
X_1	1.12	.38	1.51	.49	.49	.25	.68
X_2	1.98	.45	.43	.90	1.76	.34	.09
X_3	1.45	.09	.25	.48	1.71	1.23	1.62
X_4	2.14	.25	1.11	.79	2.99	.57	.22
X_5	.15	.84	1.07	.85	.24	.59	.18
X_6	.34	.12	.91	.59	.58	.16	.11
X_7	1.86	.55	2.02	.61	.97	1.30	.24
X_8	.57	1.12	1.80	.75	2.83	.97	.02
X_9	.96	.29	2.32	1.37	1.02	1.88	.01
X_{10}	3.84	.76	.55	.28	.56	1.20	4.22
X_{11}	4.33	.87	1.25	1.22	.69	1.94	.52
X_{12}	4.73	.47	1.83	.67	.64	.93	.10
X_{13}	2.13	.40	1.00	2.16	.20	1.44	1.60
X_{14}	1.57	1.12	.51	1.14	4.38	1.23	1.76
X_{15}	2.06	1.48	.41	.74	.55	1.63	.99
X_{16}	.95	1.14	1.19	1.67	.59	1.18	1.59
X_{17}	1.81	.39	.77	.56	1.48	3.30	1.07
X_{18}	2.06	.74	1.01	2.20	1.50	2.40	.43
X_{19}	.49	2.23	.93	.53	.84	.46	.58
X_{20}	1.43	.72	1.15	.79	.87	1.06	.54
X_{21}	.94	.86	.72	1.84	.33	.68	3.54

TABLE 2: VARIANCE RATIOS "INPUT ITEMS" MEASURES

INDEPENDENT (GROUPED) VARIABLES

Name of Measure	Country	Section of Industry	Level of Organisation	Size of Firm (Manuals)	Size of Firm (Staff)	Age of EDP System	State/ Private Ownership
F.05	2.54	2.54	2.32	2.54	2.44	2.69	4.14
Y_{1A}	1.28	.94	.42		.55	2.68	0.00
Y_{1B}	.91	1.40	1.09	1.03		.77	.22
Y_{2A}	2.20	.27	.71		1.49	.90	0.00
Y_{2B}	1.16	.12	1.55	.17		.19	.06
Y_{3A}	1.51	.64	.68		1.96	2.85	.61
Y_{3B}	.47	.60	1.13	.57		.42	.25
Y_{4A}	1.60	.91	.73		2.75	.27	.16
Y_{4B}	3.02	.56	1.12	.94		.12	.24
Y_{5A}	4.61	1.19	1.46		.61	.86	0.00
Y_{5B}	1.51	2.43	1.40	.49		.34	0.00
Y_{6A}	1.56	1.01	1.04		.25	3.94	.05
Y_{6B}	1.37	.60	2.02	.67		1.29	1.32
Y_{7A}	2.13	.31	.50		1.19	1.25	.01
Y_{7B}	1.52	1.00	.43	3.09		.33	0.00
Y_{8A}	1.72	1.07	.41		.27	.72	.38
Y_{8B}	.59	1.80	.52	1.23		1.02	0.05
Y_{9A}	.80	1.10	1.41		.68	1.10	.27
Y_{9B}	.50	.95	3.17	.15		.13	0.05
Y_{10A}	1.98	1.85	1.23		.44	1.31	.66
Y_{10B}	1.68	1.08	2.10	1.32		.24	0.08
Y_{11A}	3.03	.74	2.93		.80	.51	.06
Y_{11B}	4.16	1.19	1.74	1.43		.70	1.39
Y_{12A}	1.21	1.21	1.18		1.01	1.28	3.07
Y_{12B}	.54	.51	1.45	2.12		.29	.90

Table 3. : VARIANCE RATIOS : SUBTOTALS OF OUTPUT

α SUBTOTALS			β SUBTOTALS			γ SUBTOTALS		
Name of Measure	Country	Section of Industry	Name of Measure	Country	Section of Industry	Name of Measure	Country	Section of Industry
F.05	2.54	2.54	F.05	2.54	2.54	F.05	2.54	2.54
X_1	.63	.51	X_1	1.62	.37	X_1	1.06	.68
X_2	2.64	.39	X_2	.69	.50	X_2	2.02	.41
X_3	2.11	.09	X_3	.75	.55	X_3	1.99	.34
X_4	2.65	.46	X_4	1.32	.42	X_4	2.57	.43
X_5	.23	.63	X_5	.33	.82	X_5	.35	1.06
X_6	.20	.21	X_6	.60	.14	X_6	.75	.21
X_7	1.90	1.07	X_7	1.51	.56	X_7	.60	1.68
X_8	1.04	1.42	X_8	.94	.87	X_8	1.09	2.13
X_9	.64	.44	X_9	.92	.27	X_9	.40	.36
X_{10}	3.63	1.17	X_{10}	2.47	.49	X_{10}	3.93	1.43
X_{11}	3.02	1.02	X_{11}	4.22	.38	X_{11}	3.50	1.42
X_{12}	2.95	.82	X_{12}	3.90	.41	X_{12}	6.12	.61
X_{13}	1.88	.94	X_{13}	1.68	.37	X_{13}	1.34	.14
X_{14}	1.52	1.37	X_{14}	1.17	1.72	X_{14}	.38	1.13
X_{15}	4.49	1.47	X_{15}	.90	1.05	X_{15}	3.50	1.75
X_{16}	1.28	1.29	X_{16}	1.10	1.10	X_{16}	2.03	.96
X_{17}	2.15	.34	X_{17}	1.18	.52	X_{17}	1.74	.49
X_{18}	1.39	.99	X_{18}	1.36	.79	X_{18}	1.35	.77
X_{19}	.41	1.90	X_{19}	.61	2.43	X_{19}	.87	2.98
X_{20}	2.38	.59	X_{20}	1.69	.69	X_{20}	1.34	.89
X_{21}	.61	.74	X_{21}	1.23	1.60	X_{21}	.51	.77

SUPPLEMENTAL ANALYSIS OF "GRID"

(Question 1.11)

J.E. Bayhylle

The analysis shown as an appendix to the tables presented by PA-Council were generally not conclusive; nor were the variance ratios. Resources were not available to subject the responses to more detailed statistical analysis. We did feel, however, that it seemed that certain patterns were emerging from the distribution of responses to the grid. These patterns became apparent in looking at the density of encircled items in the tables shown previously.

Accordingly, a further analysis was made of the responses shown on Question 1.11 (The Grid). These analyses ranked the frequency of collection of input by the three stages of development - i.e. collected now; currently being developed; and, planned for the future. We further ranked the responses to frequency of use of output, again by the three stages of development. These results are shown as Tables 1, 1A, 2, 2A.

Bar Charts have been prepared to illustrate how the frequencies of response emerge as discernible patterns. Two charts have been prepared for each input element (1-12) - one for manual and one for staff - showing the frequency of response to the use of that input item for output. These charts are labelled from 1-24 and follow this discussion.

The following illustrates the most significant points emerging from these data.

GRID C (collected now)

Most frequently collected input data :-

1. Personnel identification
2. Internal Company identification
3. Benefit data
4. Salary data
5. Manpower costs data
6. Wage data.

Excluding 6, there are more inputs for staff employees than for manual employees.

This data is being used for, in order of frequency upwards :-

1. Payroll
2. Headcount
3. Internal labour statistics
4. Salary Administration
5. Wage Administration
6. External labour statistics.

Excluding 5, more outputs for staff than manual employees.

Comments

1. Input and output concerned with employees in aggregate.

2. Input relating to individuals - e.g. employee performance (more on manuals than staff)/education/training, are least frequently collected (10-9-12).

3. Output relating to individuals fairly low down the table - e.g. transfer/promotion/recruitment/appraisal/training/management and career development (11-13-16-17-18-20).

GRID D (currently being developed)

Most frequently collected input data :-

1. Personnel identification
2. Internal Company identification
3. Education
4. Benefit
5. Salary
6. Manpower cost

Being used for :-

1. Headcount
2. Internal labour statistics
3. Personnel Planning
4. External labour statistics
5. Manpower Analysis
6. Payroll

Excluding 4, more outputs for staff than manual employees.

Comments

1. Inputs the same as for C, except that education has moved up into third position (9 in C), moving the others down a place.

2. Outputs. Wage and Salary administration are out, down to 13 and 10, and are replaced by Personnel Planning and Manpower Analysis.

3. Payroll, down from first to sixth place in output column.

4. Emphasis here is still primarily on aggregates.

GRID E (planned for future)

Most frequently collected input data :-

1. Education
2. Training
3. Personnel identification
4. Internal Company identification
5. Employee performance
6. Benefit

Being used for :-

1. Manpower Planning
2. Appraisal
3. Promotion
4. Management and career development
5. Training
6. Transfer

Comments

1. More education detail inputs than any other, training and employee performance in at 2-5. The emphasis here is leaning towards qualitative inputs.

2. It seems significant that the six most frequent outputs have not been included in the first six in GRID C or GRID D. With the exception of Manpower Planning (which may be argued to deal with aggregates), all are concerned with individuals rather than aggregates. As for inputs, emphasis is on qualitative rather than quantitive information.

ANALYSIS OF GRID C, GRID D, and GRID E

Considering INPUTS, there is a change in emphasis in the data collected. The total number of inputs drop; the number in D is only 38% of C, and this rises slightly in E to 47.84% of C.

Personnel identification - This is in the top three for C/D/E (1-1-3)

Internal Company identification - This is in the top four for C/D/E (2-2-4)

Benefit/Salary - These remain fairly level, the only variation between C and E is a drop of three places down for both of them.

Compensation and Benefit - These remain on a similar level, going from 7 to 9 over C, D and E.

Manpower Costs - There is a sharpish fall from D to E, 6 - 10.

Wages - Similar sharpist fall from D to E, 7 - 11.

Education - Dramatic increase from C to E, particularly from C to D, 9-3-1.

Training - A similar dramatic increase, particularly between D and E, 12-10-2.

Employee Performance - Here, there is an increase, but a less dramatic one, 10-9-5.

Considering OUTPUTS now, there is a similar fall in the number of outputs to that noted for the inputs discussed above. The outputs of D are approximately 39% of C, rising slightly in E to 49.5% of C.

Payroll - Output remain important between C and D, and there is a dramatic fall between D and E, 1-4-21.

Headcount - Between C and D, it is up one place, and then there is a sharp decrease between D and E, 2-1-16.

Salary/Wage Administration - These are steadily diminishing importance also, considering Salary, 4-10-18; considering Wage, 5-13-19. This trend is true of Salary and Wage negotiation also.

Labour Statistics, Internal and External. - Increasingly less important, External more so than Internal.

Manpower Analysis/Personnel Planning - Increasingly important in D, then less again in E, but down for C.

Turnover - Relatively stable, stays roughly half-way down the tables.

Transfer - Decreasing importance to D, then a sharp upward rise in E.

Promotion - 13-7-3.

Manpower Planning - Sharp upward rise, C/D/E, 14-8-1.

Appraisal - 17-11-2

Management and Career Development/Training - For both of these, there is a less dramatic increase in D, but a sharp increase in E; 20-17-4; 18-16-5.

Comments

1. Bearing in mind that not all respondents are considering development from their present position, we must treat these trends with caution.

2. The trend that does emerge is that for those companies that are either developing now, or are planning to enhance their system, the emphasis is for more and more individualistic qualitative use of the data.

TABLE 1

INPUT ITEMS - QUESTIONS 1.11 (GRID) RANKED BY FREQUENCY OF COLLECTION
C = COLLECTED NOW. D = CURRENTLY BEING DEVELOPED. E = PLANNED FOR FUTURE

1 - High
12 - Low

Item Number	Item Identity	Stage of Development		
		C	D	E
1	Personal Identification Data	1	1	3
2	Benefit Data	3	4	6
3	Internal Company Identification Data	2	2	4
4	Employee Performance Data	10	9	5
5	Wage Details	6	7	11
6	Salary Details	4	5	7
7	Education Details	9	3	1
8	Extra-Firm Data	8	11	12
9	Compensation & Benefit Admin Data	7	8	9
10	Manpower Cost Data	5	6	10
11	Training Data	12	10	2
12	Other Details/Data	11	12	8

Source: Questionnaire 1, Question 1.11

TABLE 1A

INPUT - USE OF OUTPUT CHART

Order	C	D	E
1	Pers. Identification Data	→	Education Data
2	Int. Co. Iden. Data	→	Training Data
3	Benefit Data	Education Data	Pers. Identification Data
4	Salary Data	Benefit Data	Int. Co. Iden. Data
5	Manpower Cost Data	Salary Data	Emp. Performance
6	Wage Data	Manpower Cost	Benefit Data
7	Comp. & Benefit Data	Wage Data	Salary Data
8	Extra Firm Data	Comp. & Benefit Data	Other
9	Education Data	Emp. Performance	Comp. & Benefit
10	Emp. Performance	Training Data	Manpower Cost
11	Other	Extra Firm Data	Wage Detail Data
12	Training Data	Other	Extra Firm Data

Input Items Ranked by Frequency of Collection if

TABLE 2

OUTPUT - USE OF INPUT - QUESTION 1.11 RANKED BY FREQUENCY OF USE
C = COLLECTED NOW. D = CURRENTLY BEING DEVELOPED. E = PLANNED FOR FUTURE

1 - High
21 - Low

Item Number	Item Identity	Stage of Development		
		C	D	E
1	Payroll	1	4	21
2	Headcount	2	1	16
3	Labour Turnover/Stability	10	12	12
4	Recruitment	16	15	9
5	Salary Administration	4	10	18
6	Wage Administration	5	13	19
7	Promotion	13	7	3
8	Appraisal	17	11	2
9	Transfer	11	14	16
10	Internal Labour Statistics	3	2	8
11	External Labour Statistics	6	4	14
12	Wage/Salary Negotiation	8	9	13
13	Manpower Planning	14	8	1
14	Management & Career Development	20	17	4
15	Manpower Analysis	7	4	7
16	Personnel Planning	9	3	10
17	Welfare Services	12	18	11
18	Training	18	16	5
19	Productivity Measurement	19	20	14
20	Manpower Economics	15	21	17
21	Other	21	19	20

Source: Questionnaire 1, Question 1.11

TABLE 2A

OUTPUT - USE OF INPUT CHART

ORDER	C	D	E
1	Payroll	Headcount	Manpower Planning
2	Headcount	Internal Labour Statistics	Appraisal
3	Internal Labour Statistics	Personnel Planning	Promotion
4	Salary Administration	External Labour Statistics)	Management & Career Development
5	Wage Administration	Manpower Analysis) 4	Training
6	External Labour Statistics	Payroll)	Transfer
7	Manpower Analysis	Promotion 7	Manpower Analysis
8	Wage/Salary Negotiation	Manpower Planning	Internal Labour Statistics
9	Personnel Planning	Wage/Salary Negotiation	Recruitment
10	Labour Turnover	Salary Administration	Personnel Planning
11	Transfer	Appraisal	Welfare
12	Welfare	Turnover	Turnover
13	Promotion	Wage Administration	Wage/Salary Negotiation
14	Manpower Planning	Transfer	Productivity Measurement) 14
15	Manpower Economics	Recruitment	External Labour Statistics)
16	Recruitment	Training	Headcount 16
17	Appraisal	Management & Career Development	Manpower Economics
18	Training	Welfare	Salary Administration
19	Productivity Measurement	Other	Wage Administration
20	Management & Career Development	Productivity Measurement	Other
21	Other	Manpower Economics	Payroll

Output Items ranked by frequency of use

CHART KEYS

Charts 1 - 24

☐ C : COLLECTED NOW

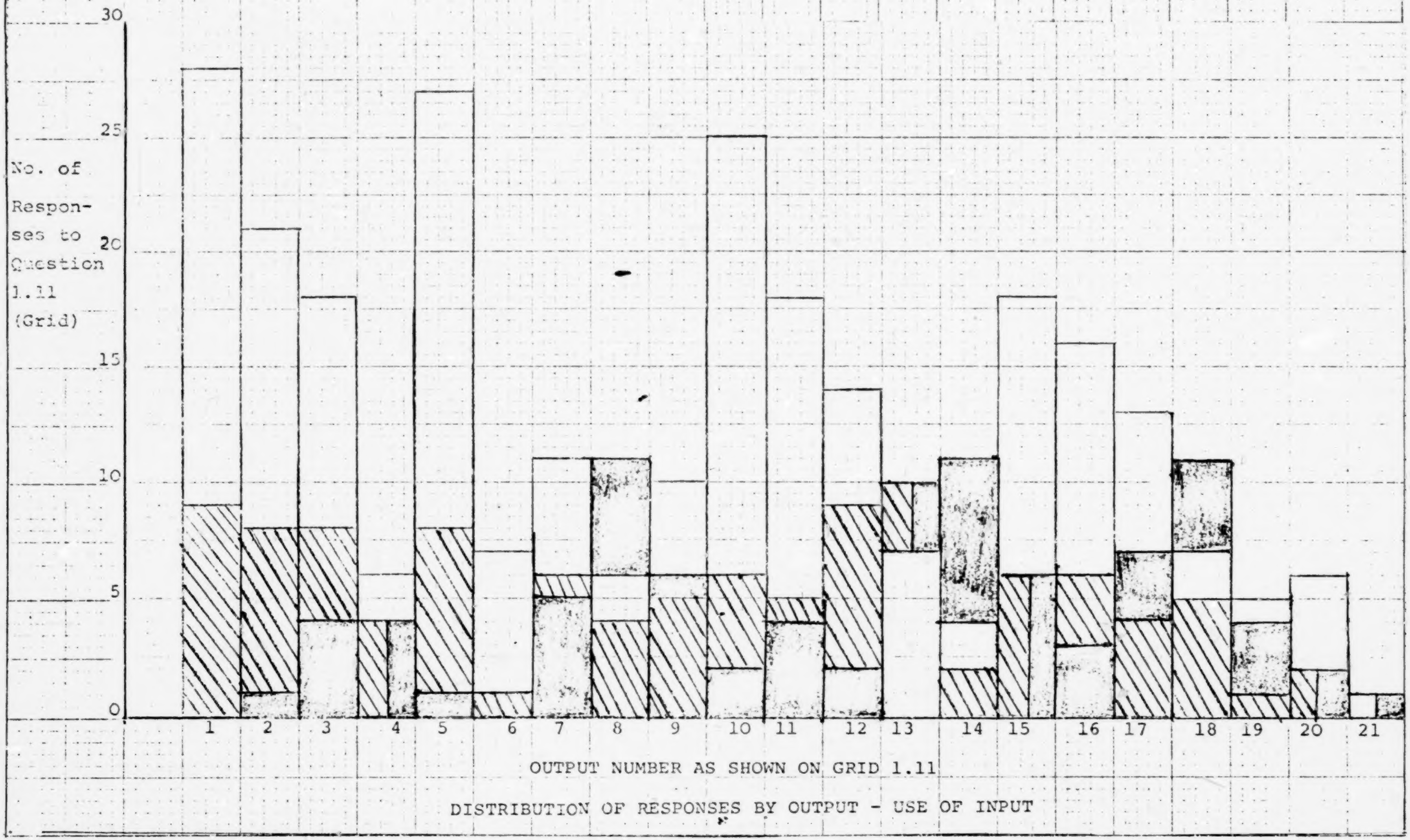
▨ D : CURRENTLY BEING DEVELOPED

■ E : PLANNED FOR FUTURE

OUTPUT - USE OF INPUT KEY (As shown on Question 1.11 (Grid))

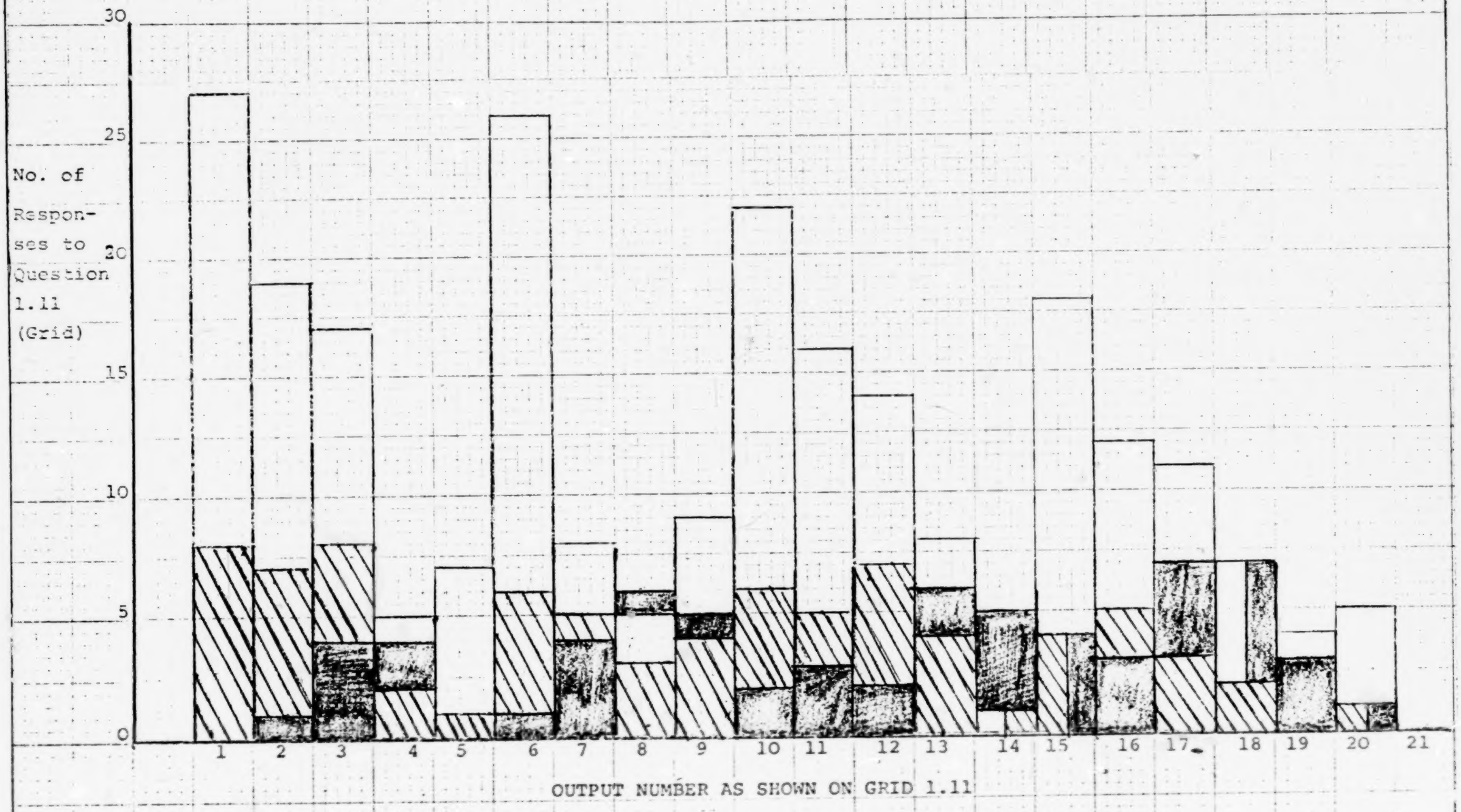
1	Payroll
2	Headcount
3	Labour Turnover/Stability
4	Recruitment
5	Salary Administration
6	Wage Administration
7	Promotion
8	Appraisal
9	Transfer
10	Internal Labour Statistics
11	External Labour Statistics
12	Wage/Salary Negotiation
13	Manpower Planning
14	Management & Career Development
15	Manpower Analysis
16	Personnel Planning (Budgets)
17	Welfare Service
18	Training
19	Productivity Measurement
20	Manpower Economics
21	Other

CHART NUMBER 1. INPUT ITEM NUMBER 1. PERSONNEL IDENTIFICATION DATA TOTAL STAFF



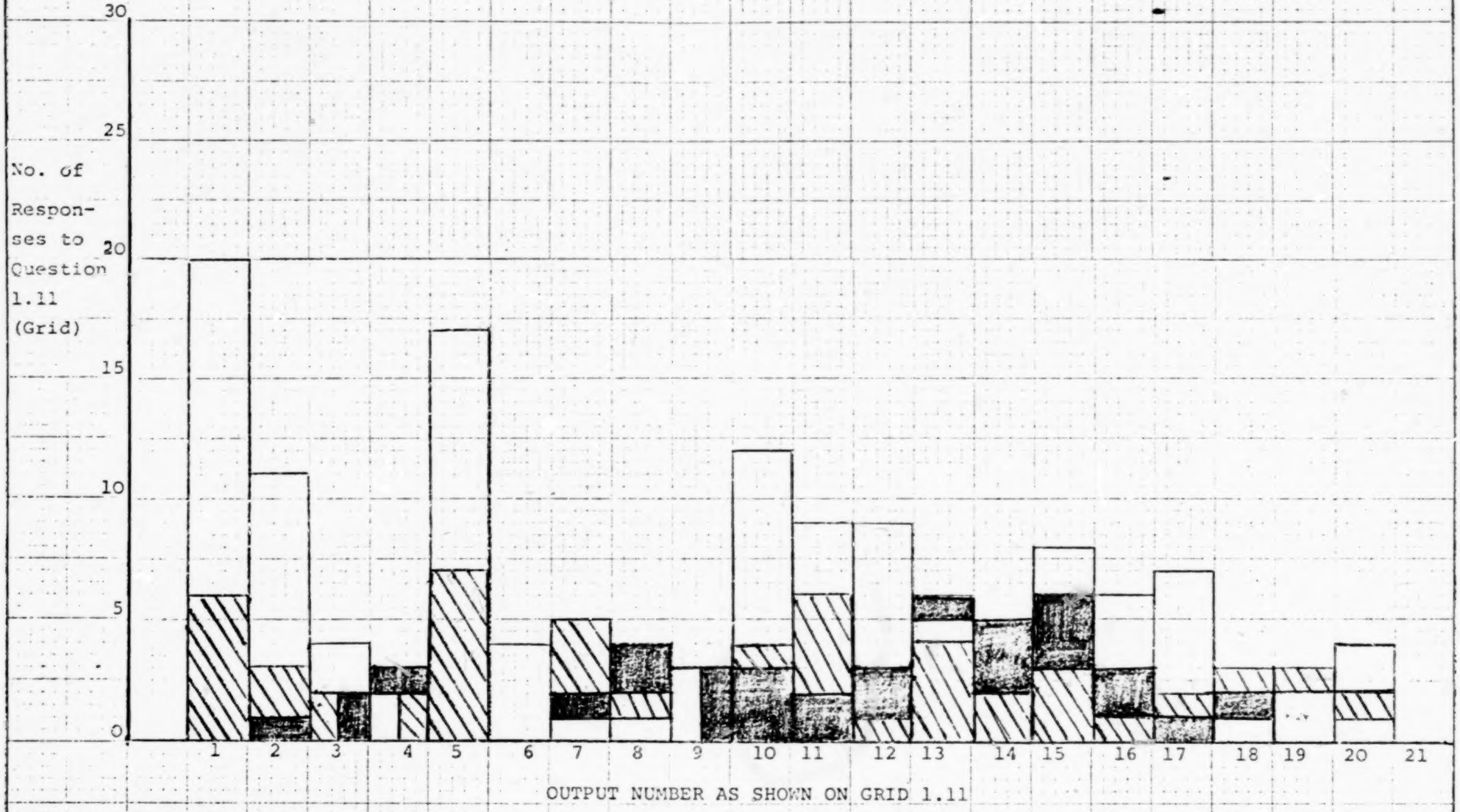
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 2. INPUT ITEM NUMBER 1. PERSONNEL IDENTIFICATION DATA. TOTAL MANUAL



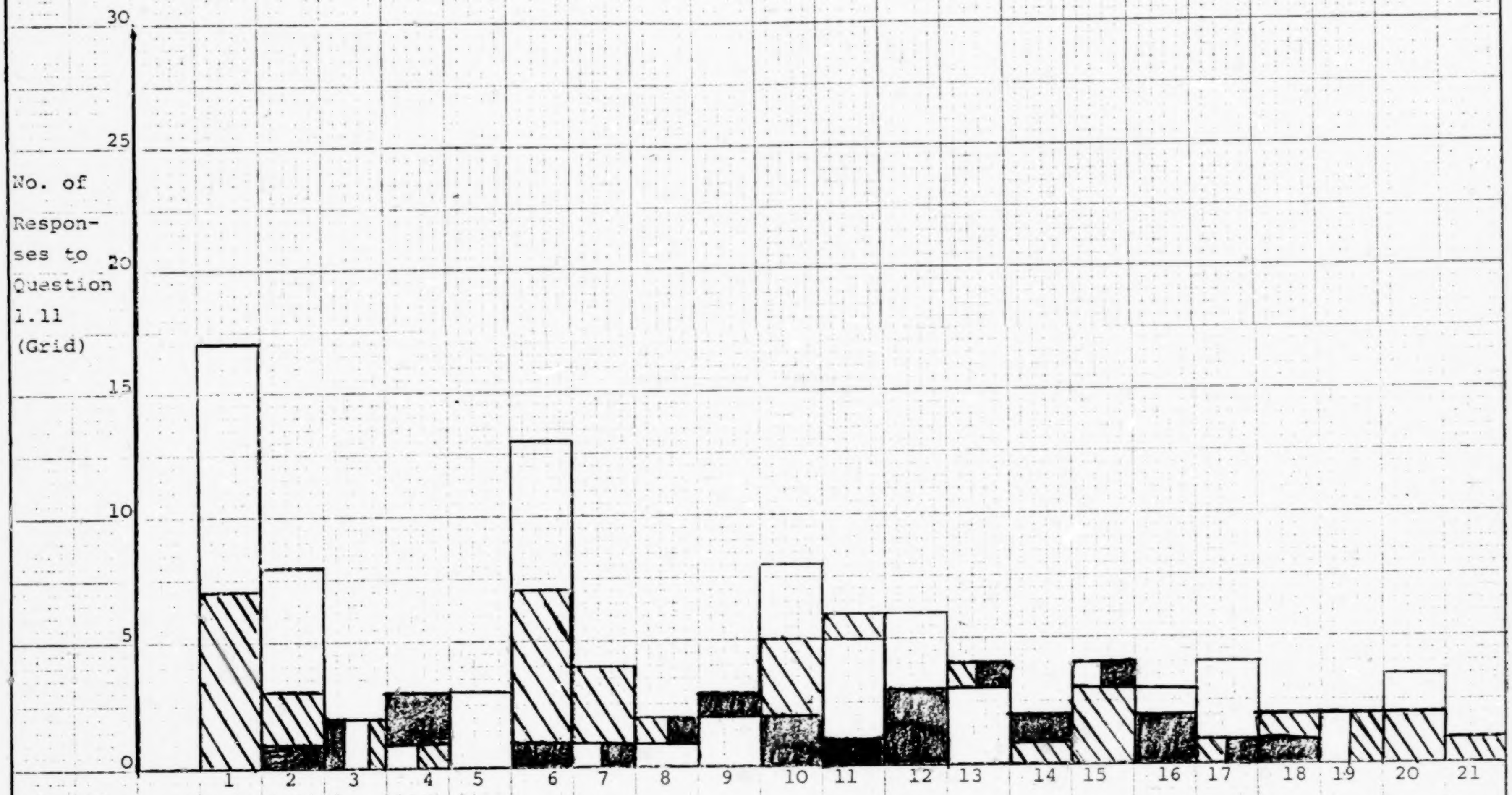
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 3. INPUT ITEM NUMBER 2. BENEFIT DATA TOTAL STAFF



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

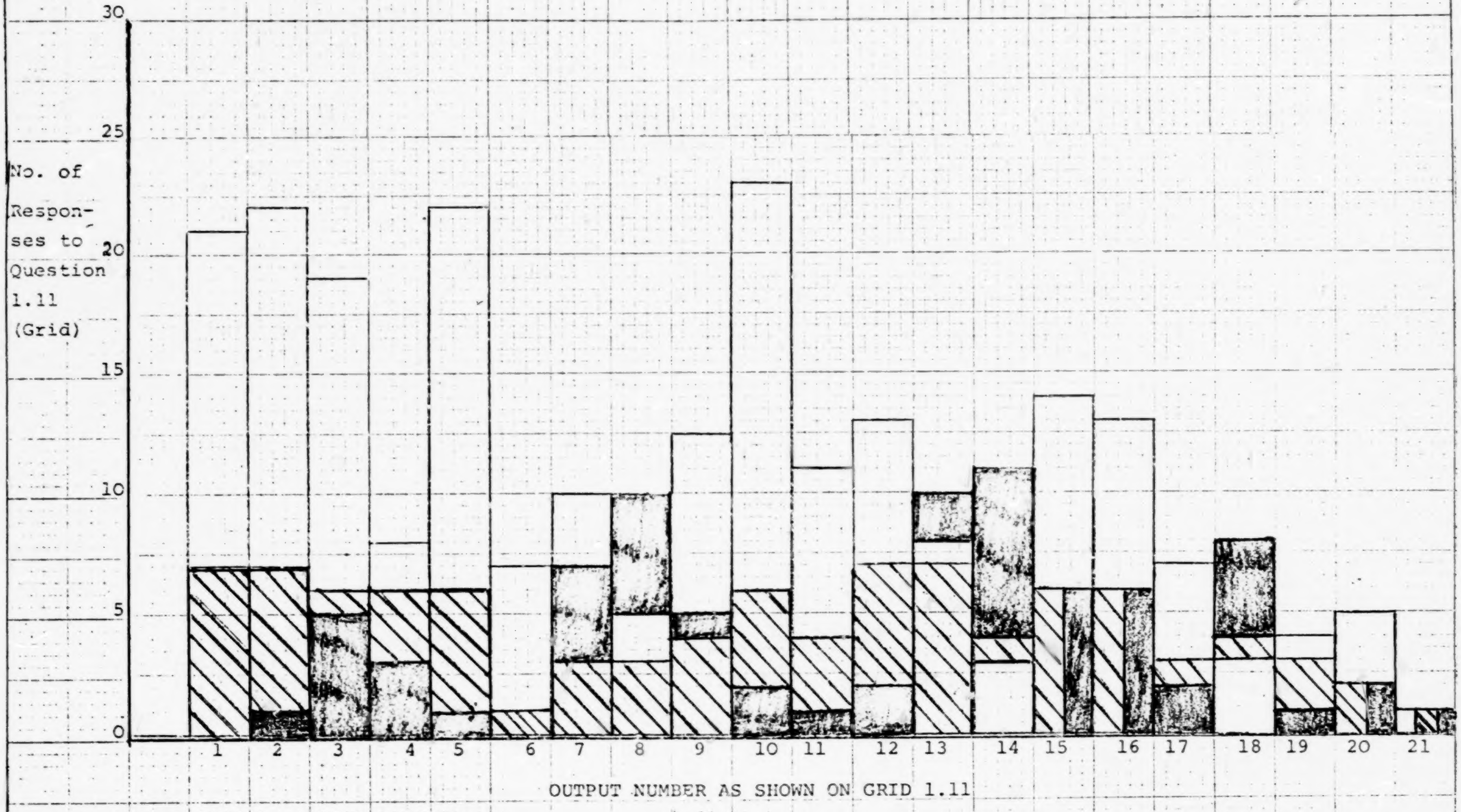
CHART NUMBER 4. INPUT ITEM NUMBER 2. BENEFIT DATA TOTAL MANUAL



OUTPUT NUMBER AS SHOWN ON GRID 1.11

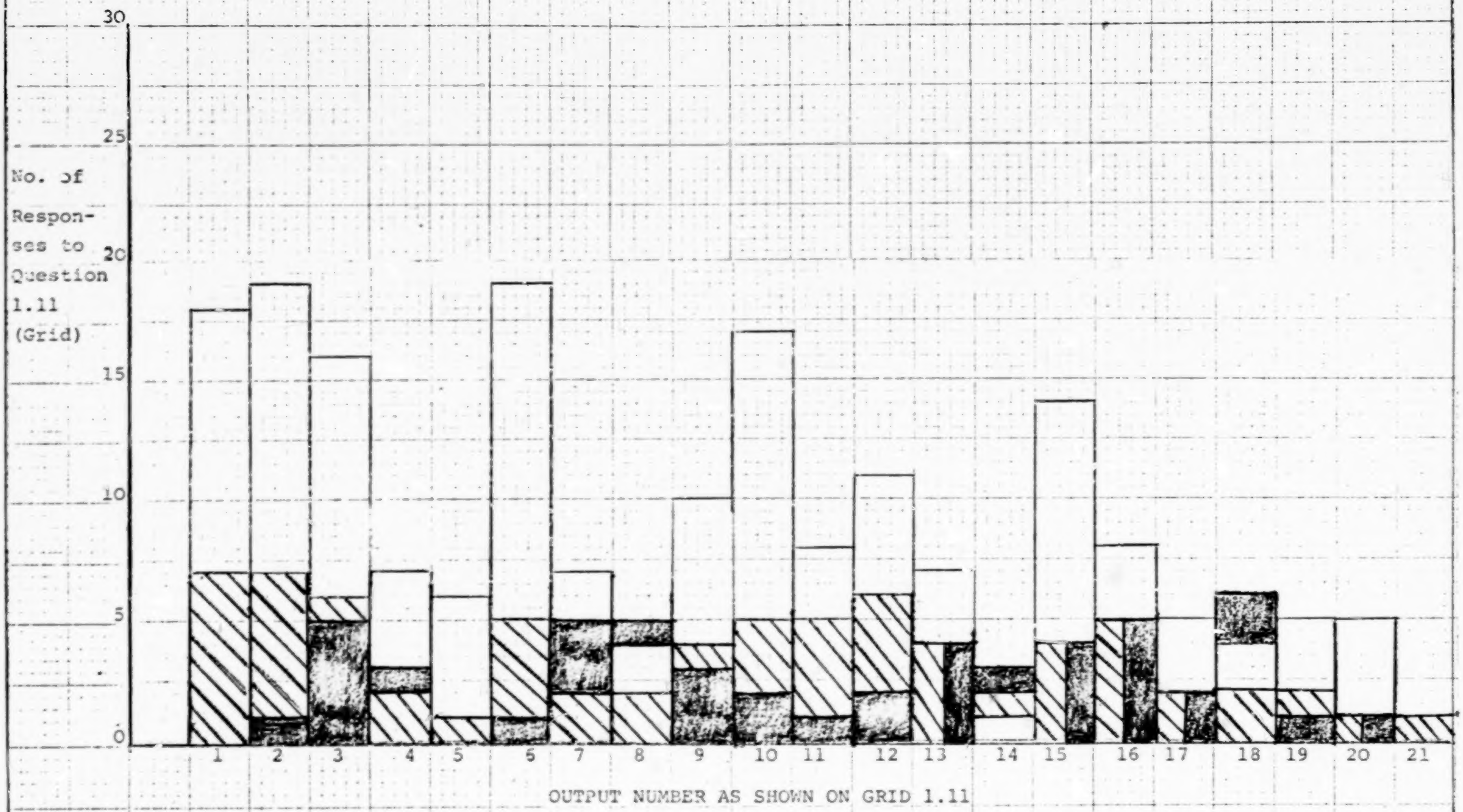
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 5. INPUT ITEM NUMBER 3. INTERNAL COMPANY IDENTIFICATION TOTAL STAFF



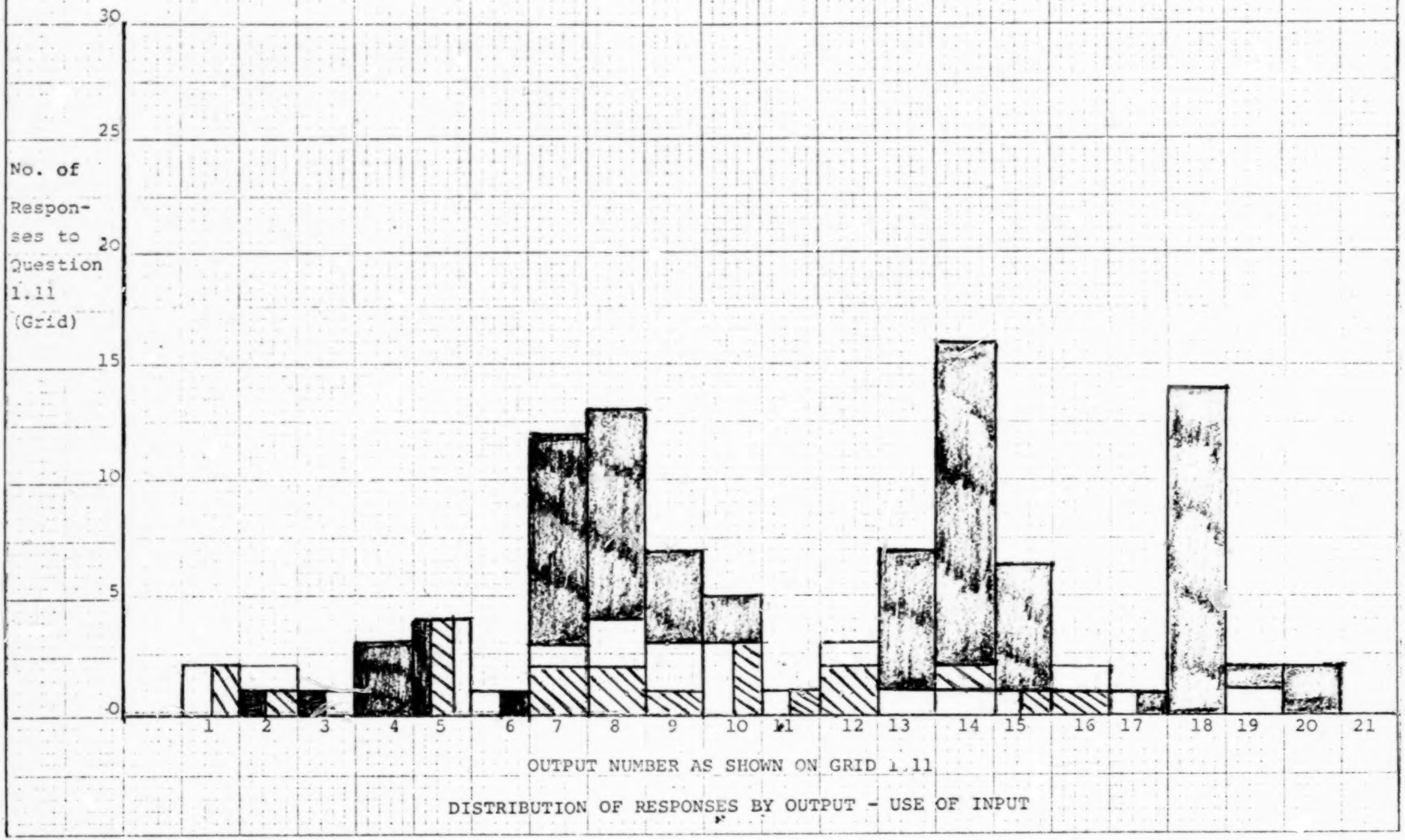
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 6. INPUT ITEM NUMBER 3. INTERNAL COMPANY IDENTIFICATION TOTAL MANUAL



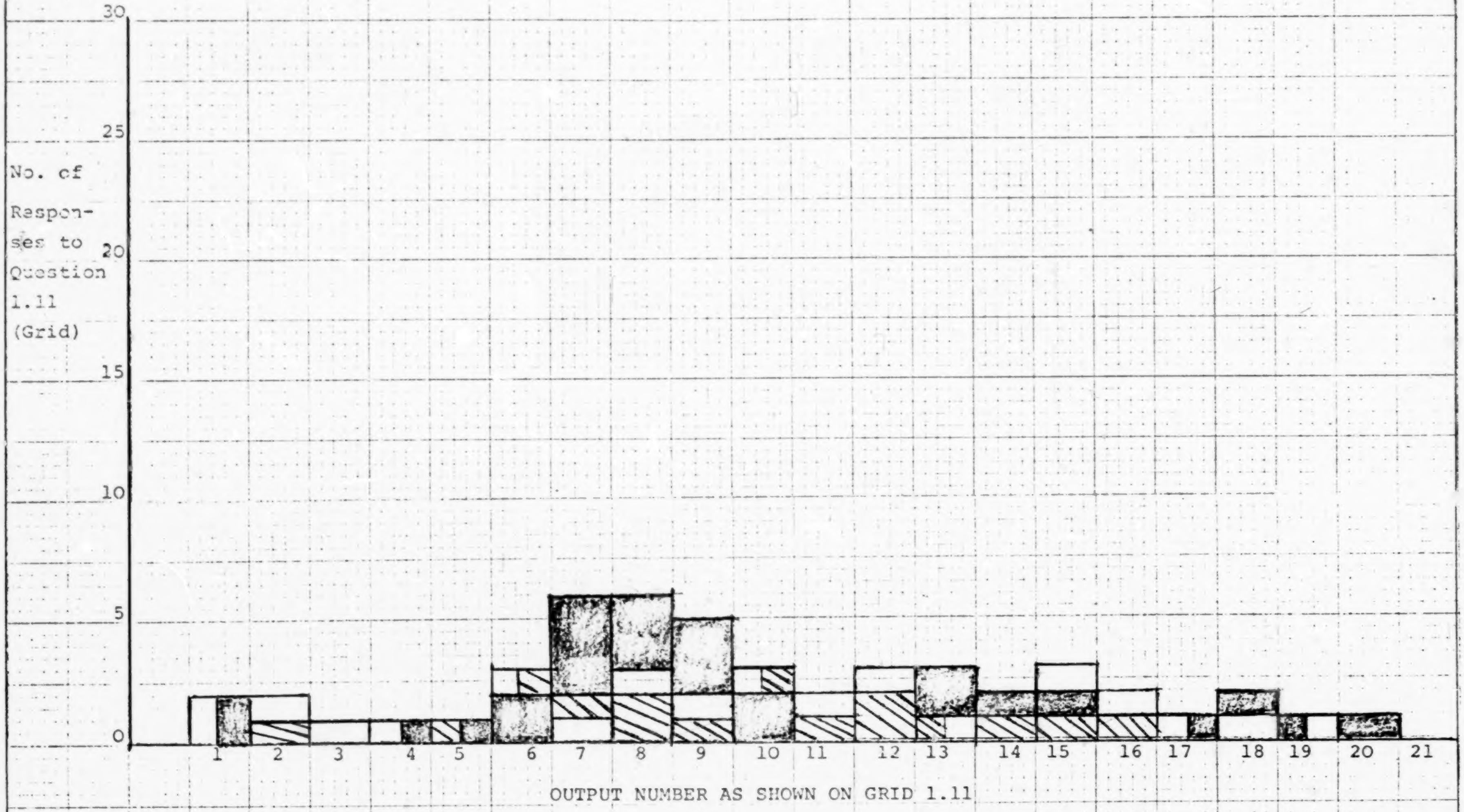
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 7. INPUT ITEM NUMBER 4. EMPLOYEE PERFORMANCE DATA TOTAL STAFF



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 8. INPUT ITEM NUMBER 4. EMPLOYEE PERFORMANCE DATA TOTAL MANUAL



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

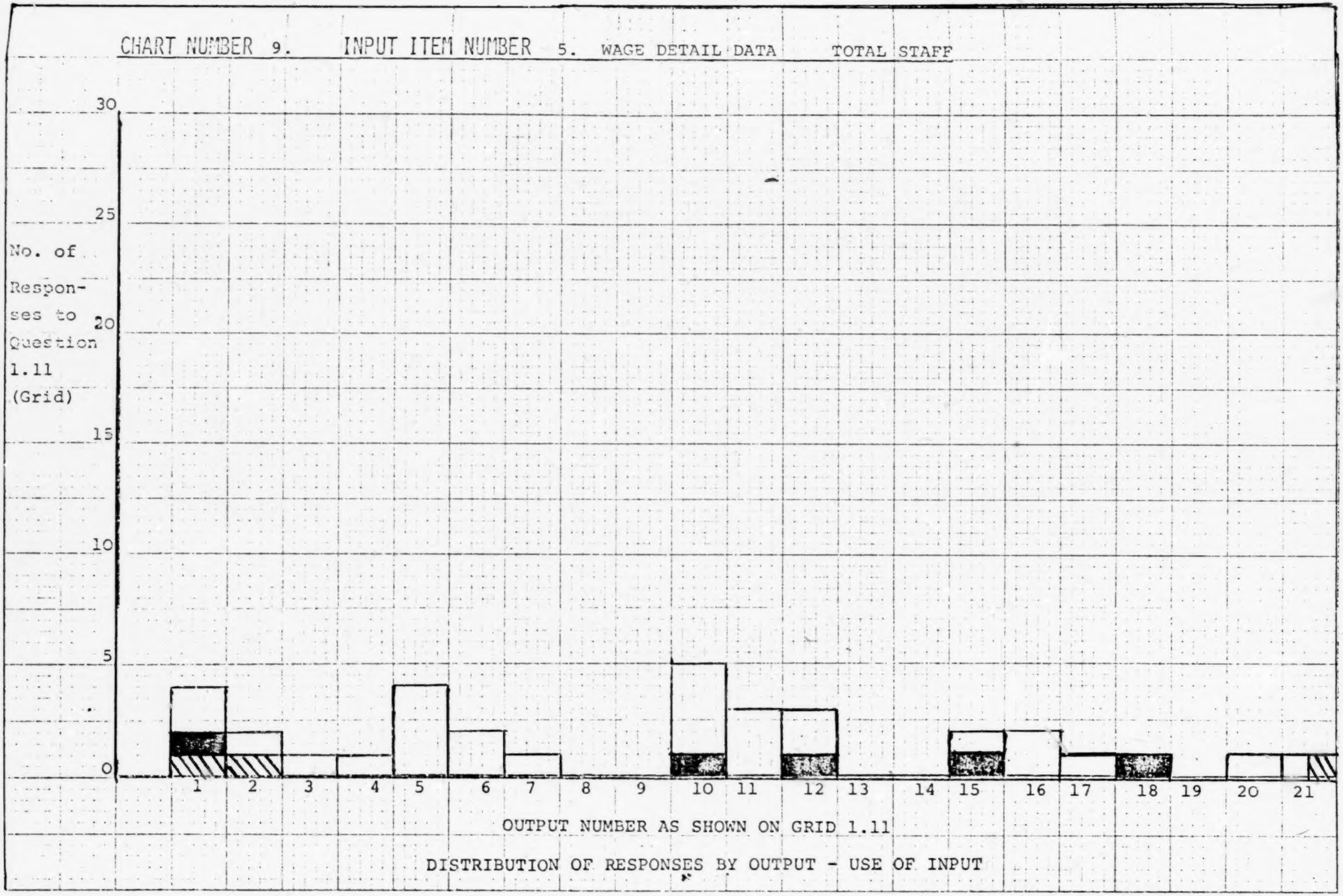
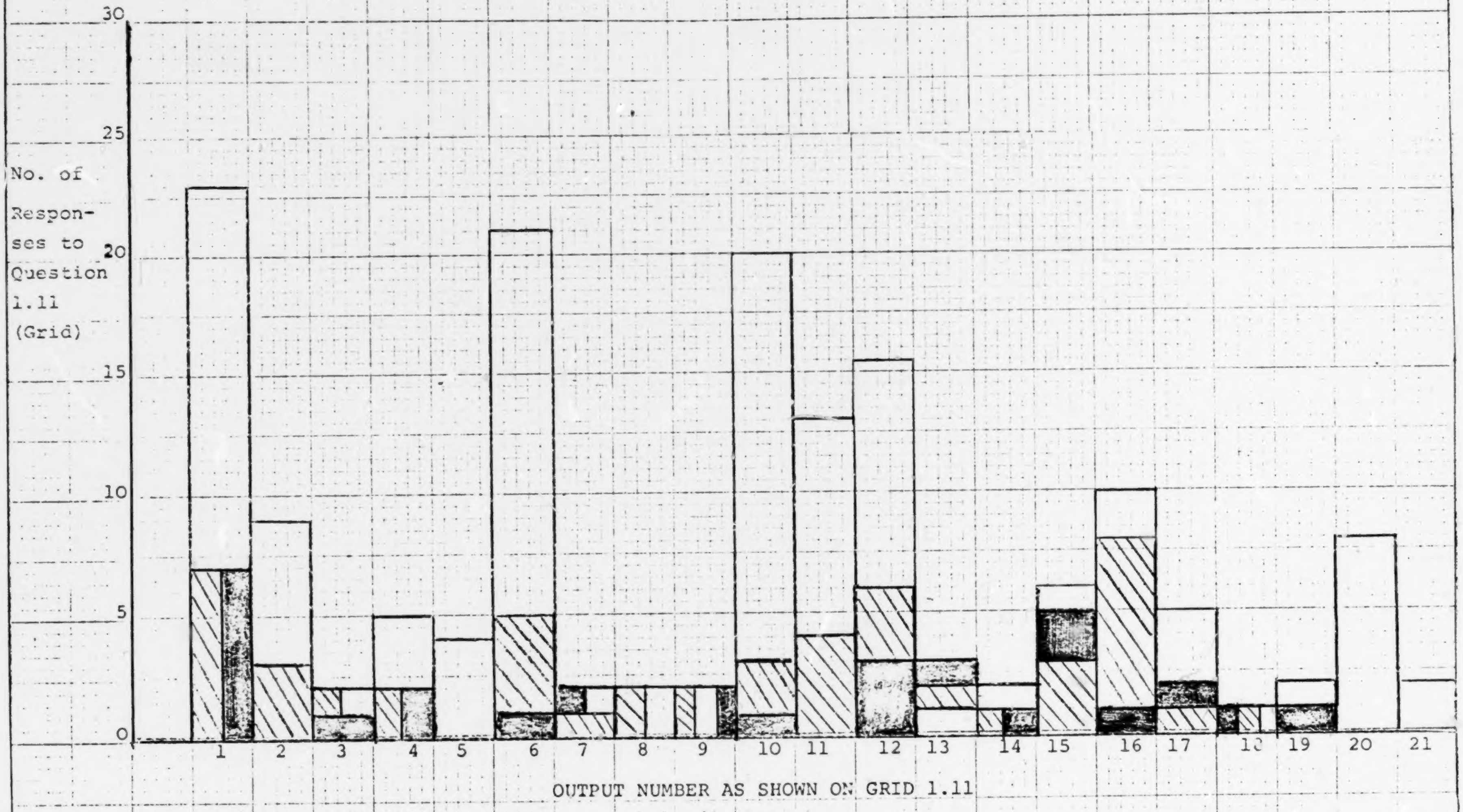


CHART NUMBER 9. INPUT ITEM NUMBER 5. WAGE DETAIL DATA TOTAL STAFF

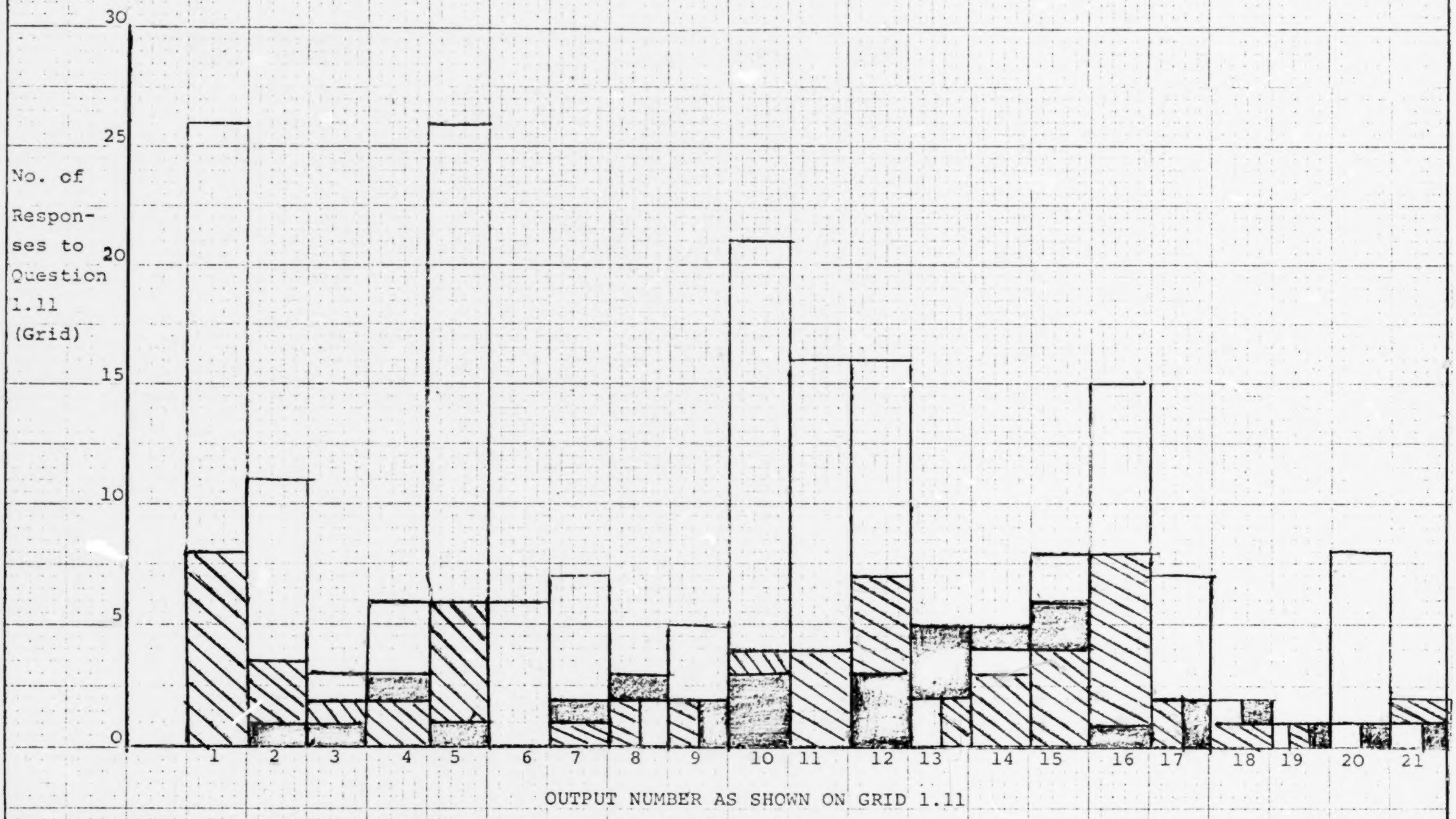
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 10. INPUT ITEM NUMBER 5. WAGE DETAIL DATA TOTAL MANUAL



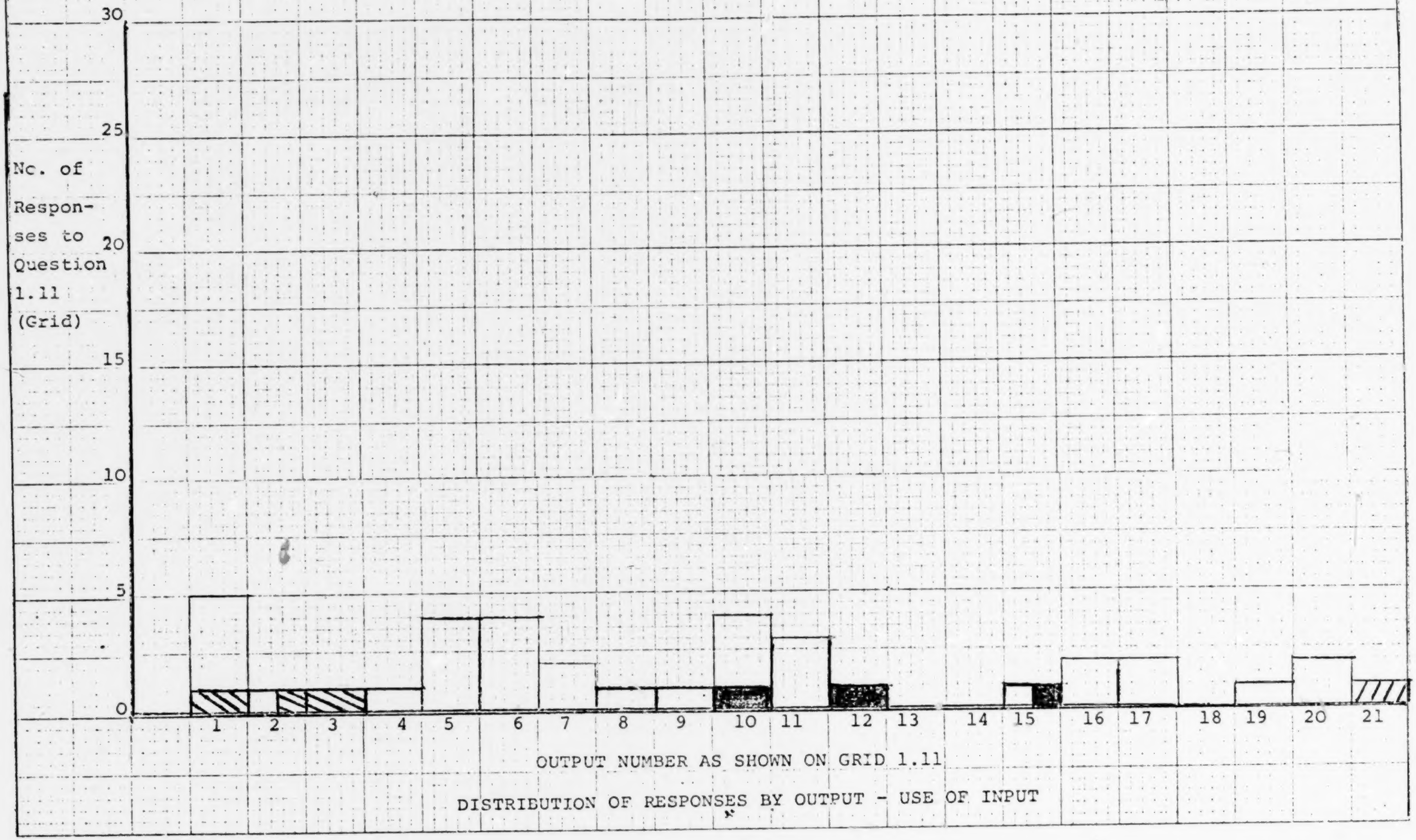
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 11 INPUT ITEM NUMBER 6. SALARY DETAILS DATA TOTAL STAFF



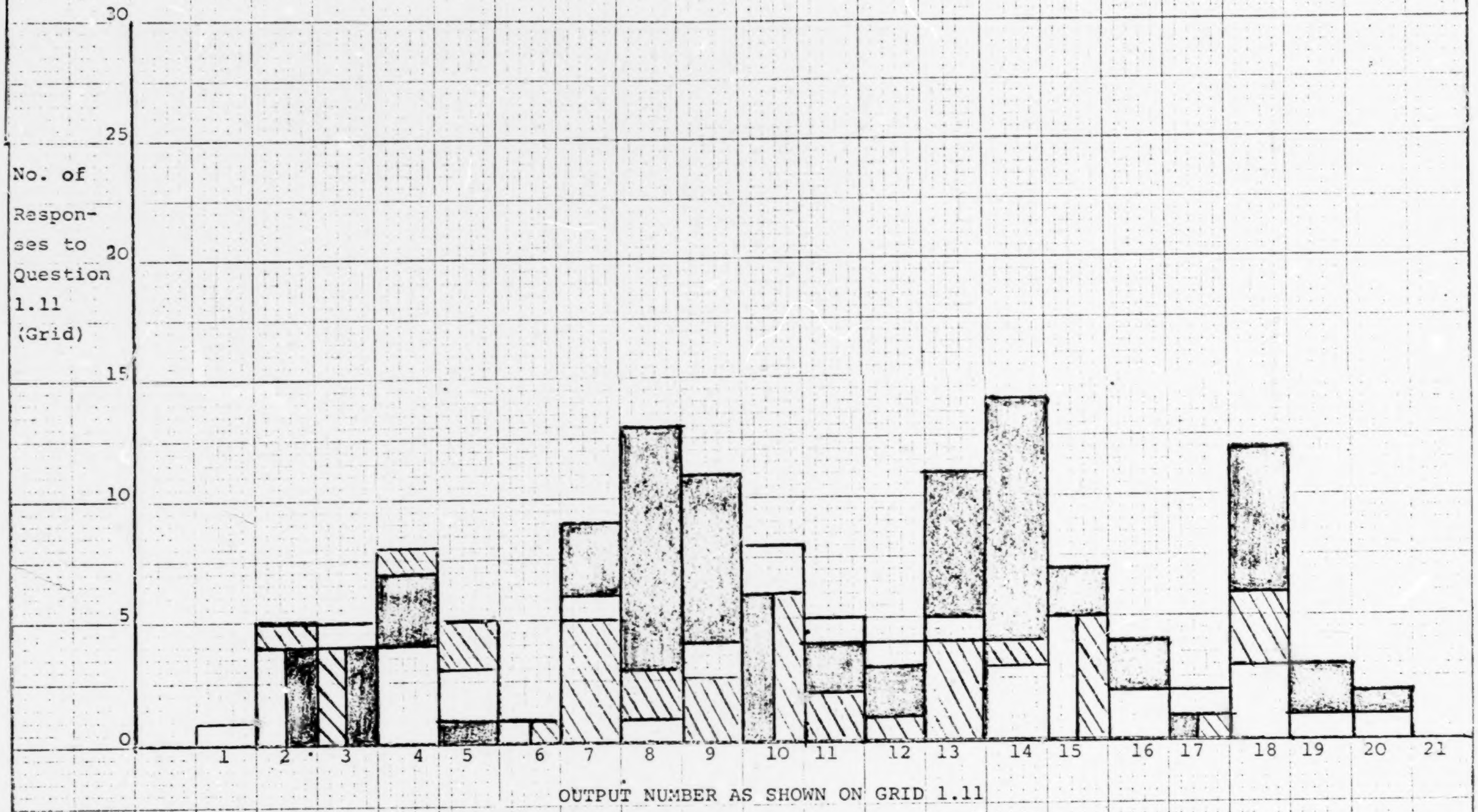
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 12   INPUT ITEM NUMBER 6. SALARY DETAILS DATA   TOTAL MANUAL



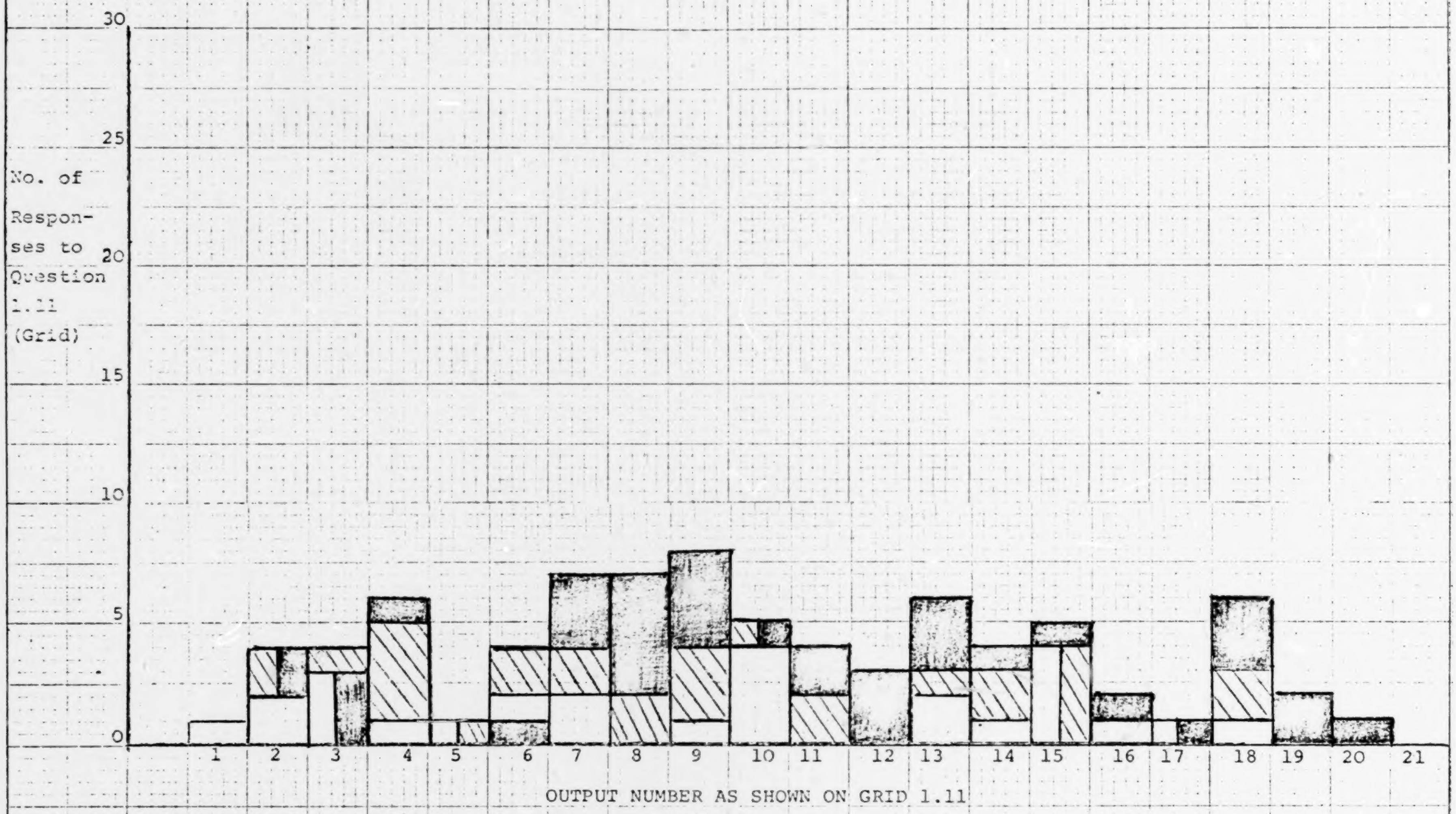
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 13. INPUT ITEM NUMBER 7. EDUCATION DETAILS TOTAL STAFF



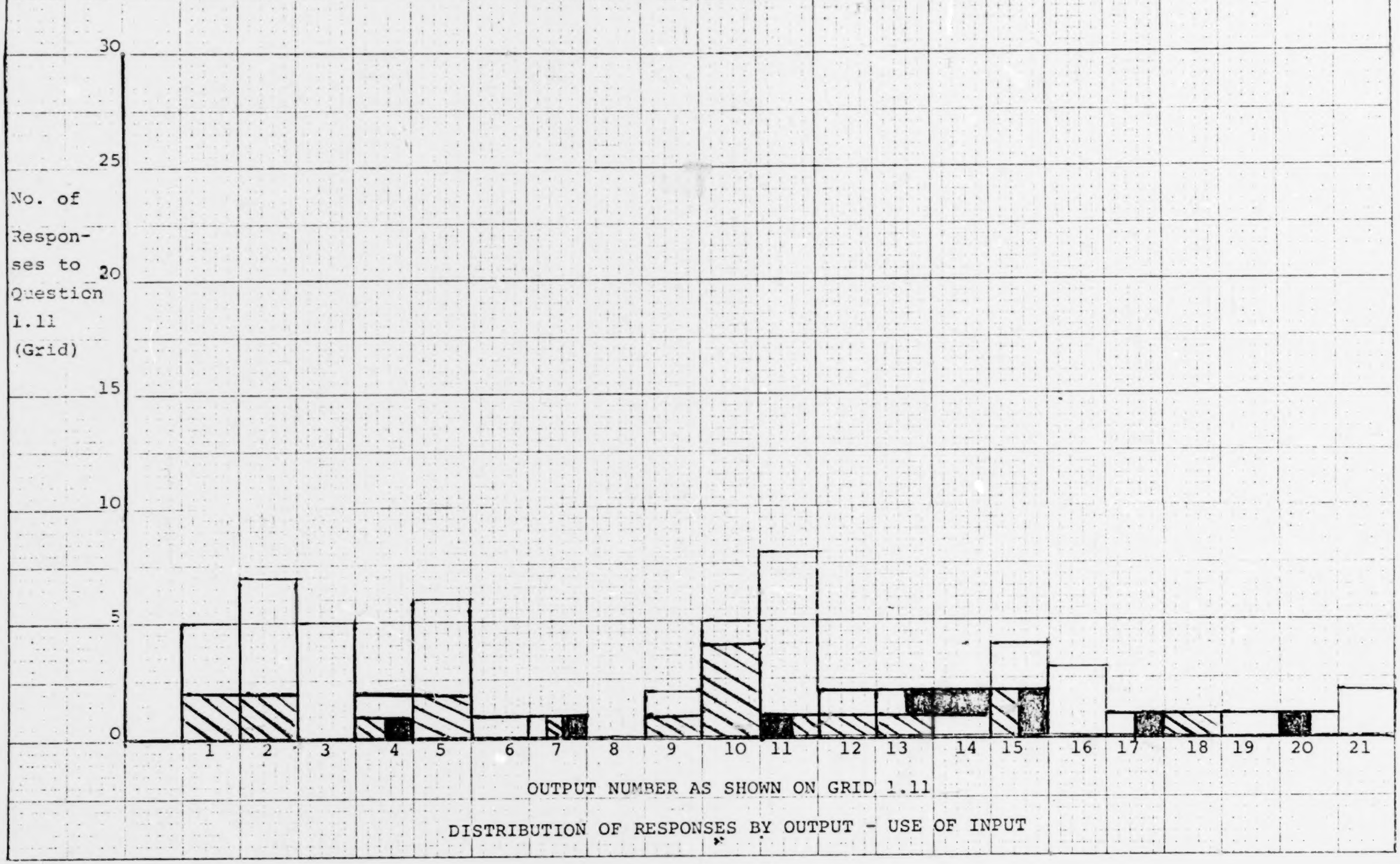
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 14 INPUT ITEM NUMBER 7. EDUCATION DETAILS TOTAL MANUAL



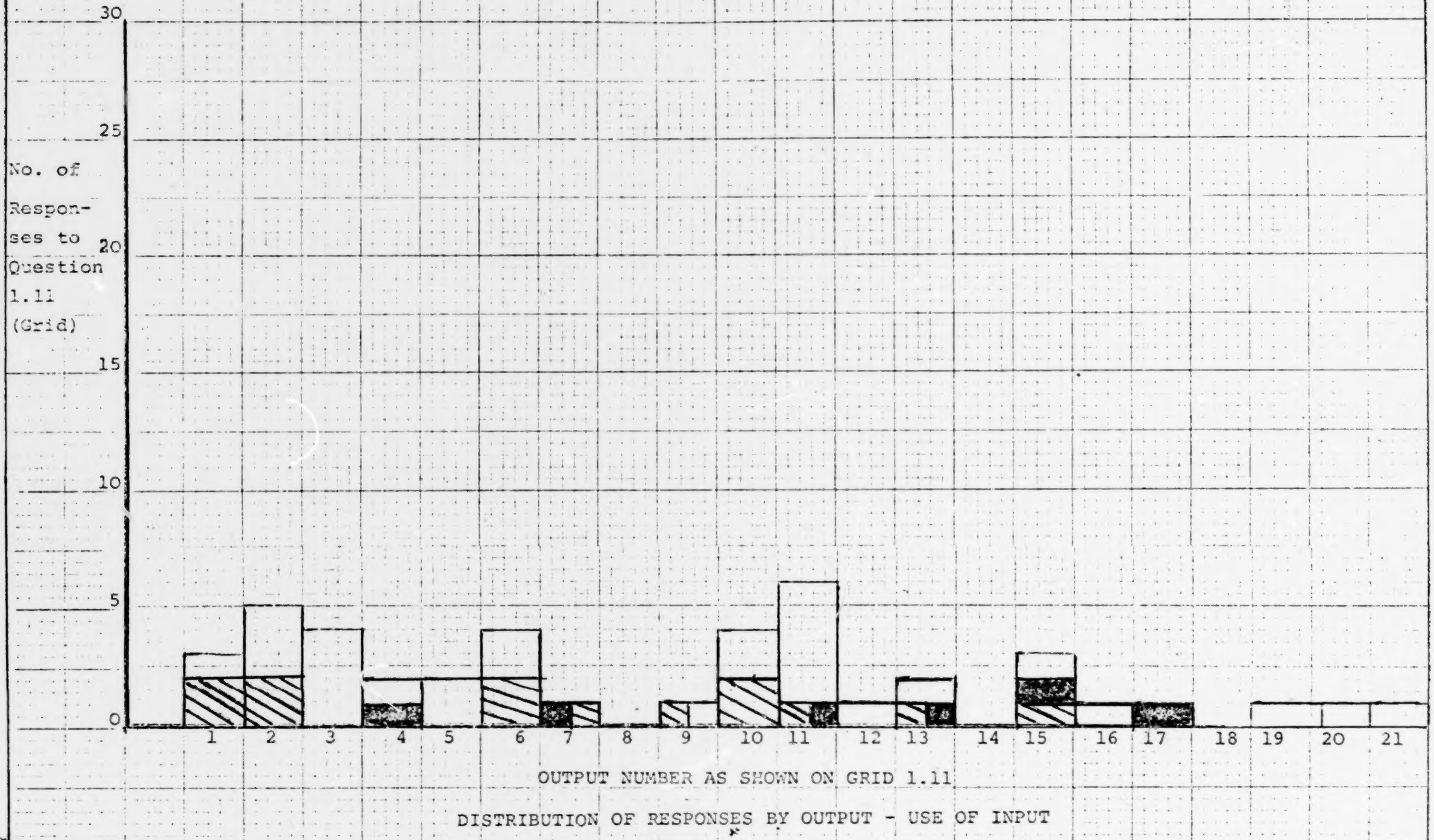
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 15. INPUT ITEM NUMBER 8. EXTRA FIRM DATA TOTAL STAFF



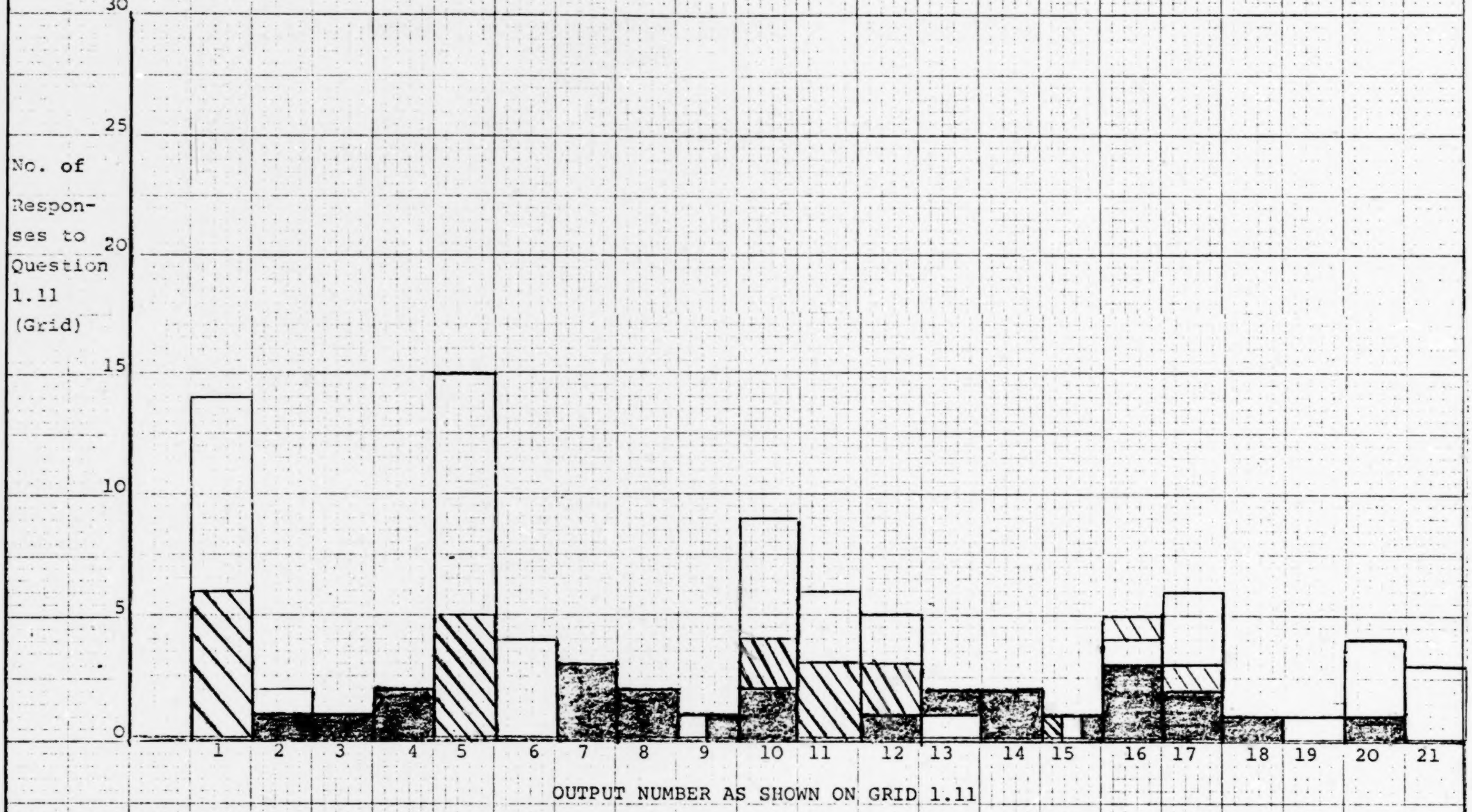
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 16. INPUT ITEM NUMBER 8. EXTRA FIRM DATA TOTAL MANUAL



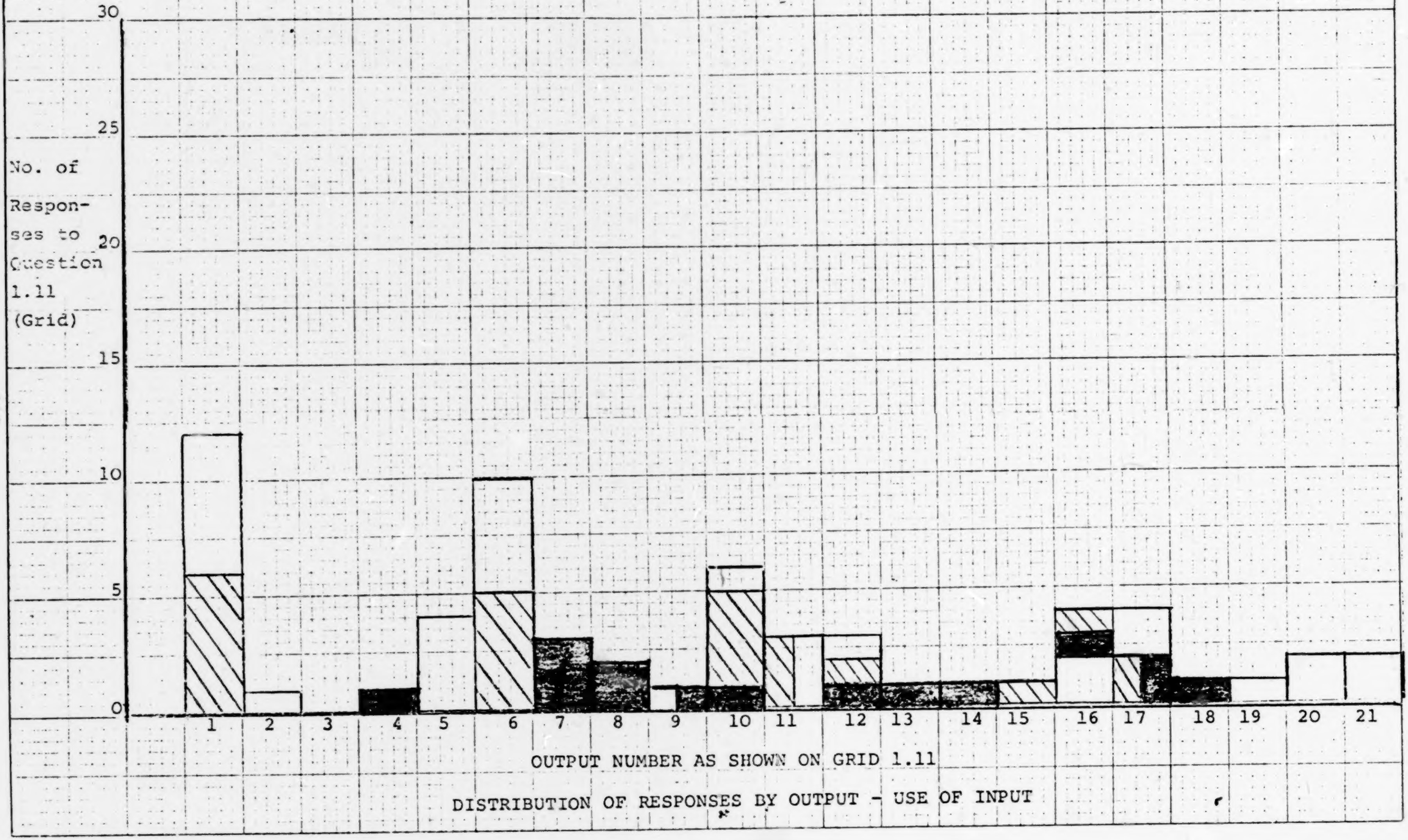
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 17. INPUT ITEM NUMBER 9. COMPENSATION & BENEFIT ADMINISTRATION TOTAL STAFF



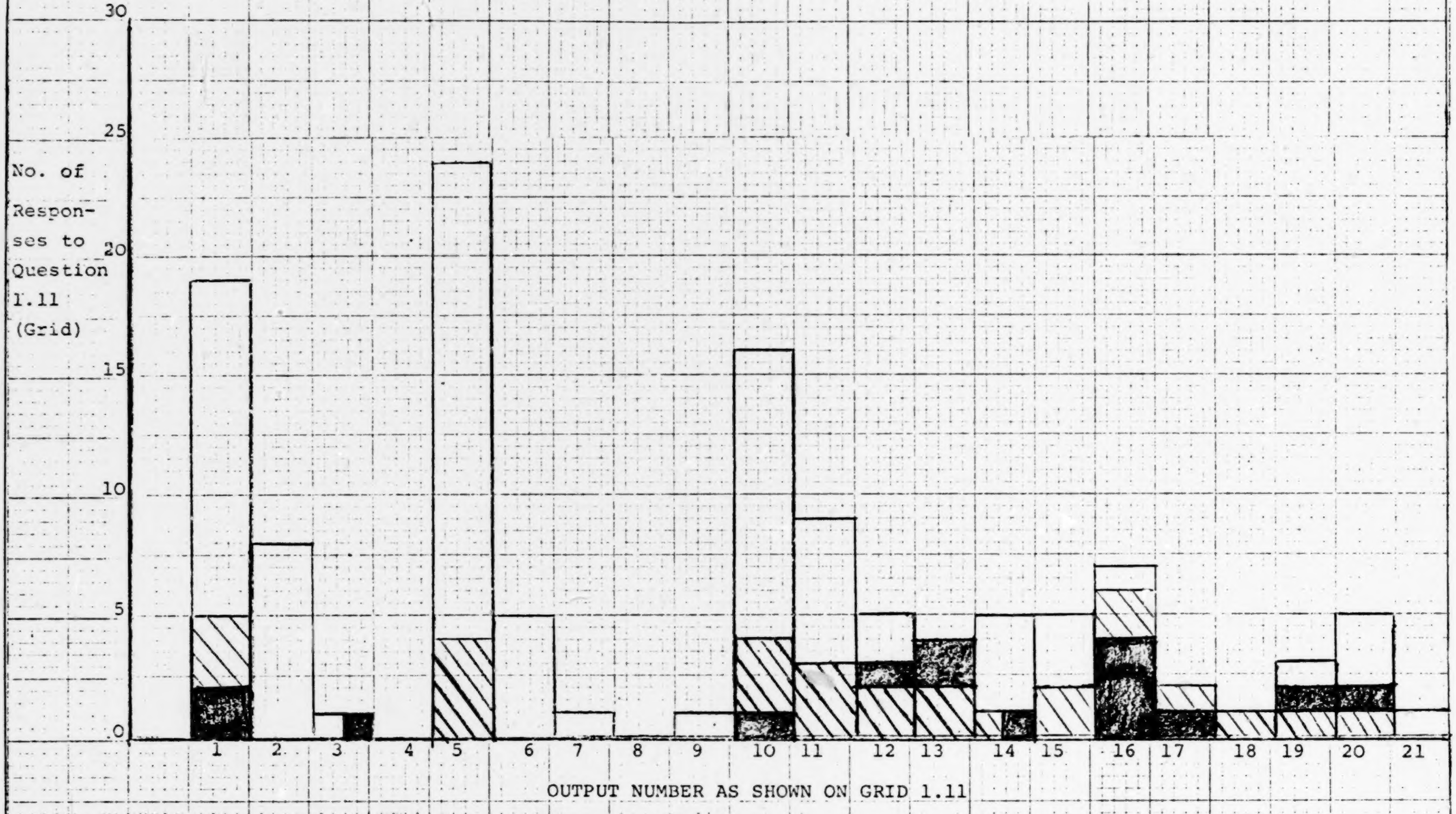
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 18. INPUT ITEM NUMBER 9. COMPENSATION & BENEFIT ADMINISTRATION TOTAL MANUAL



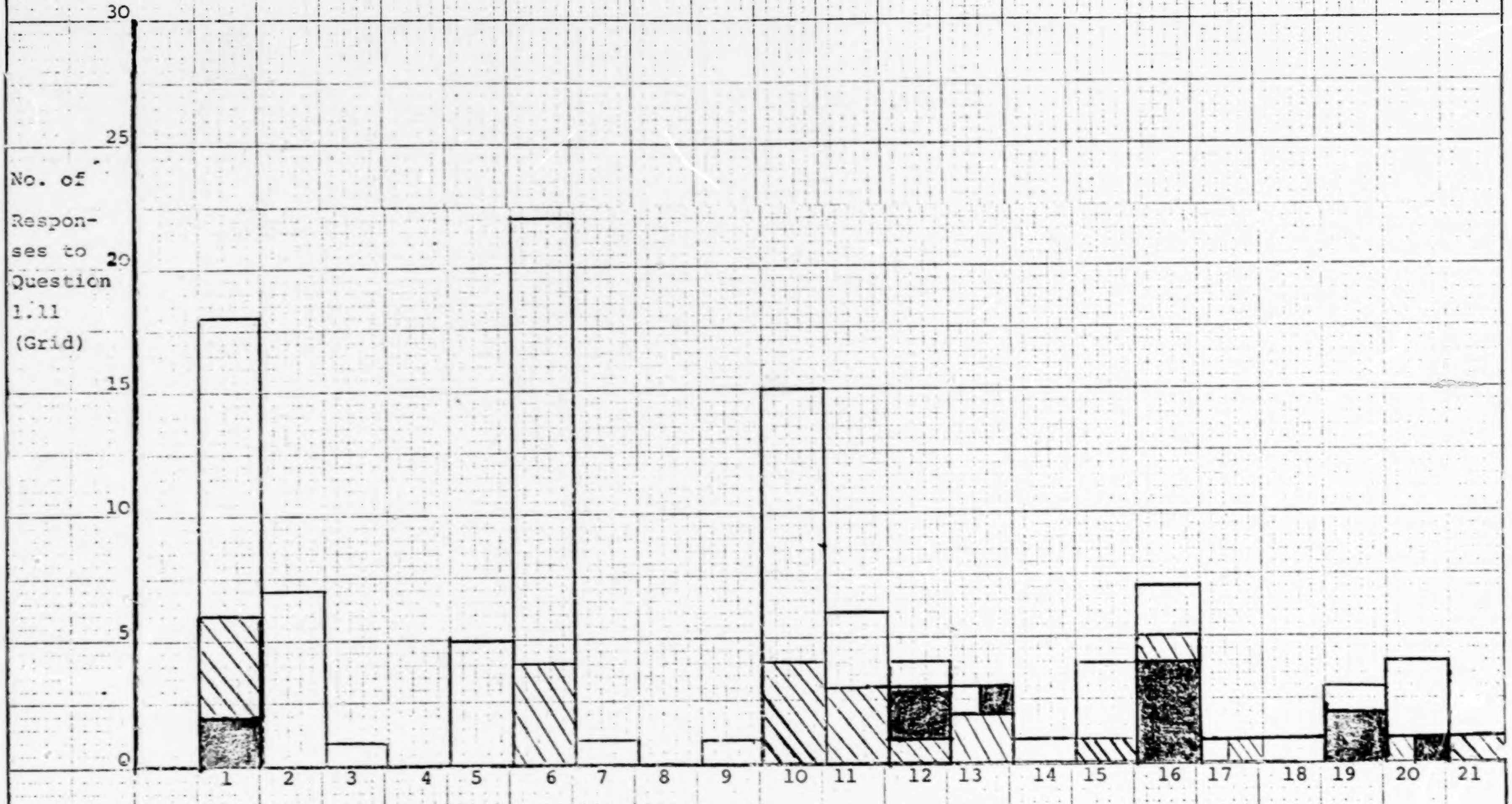
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 19. INPUT ITEM NUMBER 10. MANPOWER COST DATA TOTAL STAFF



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

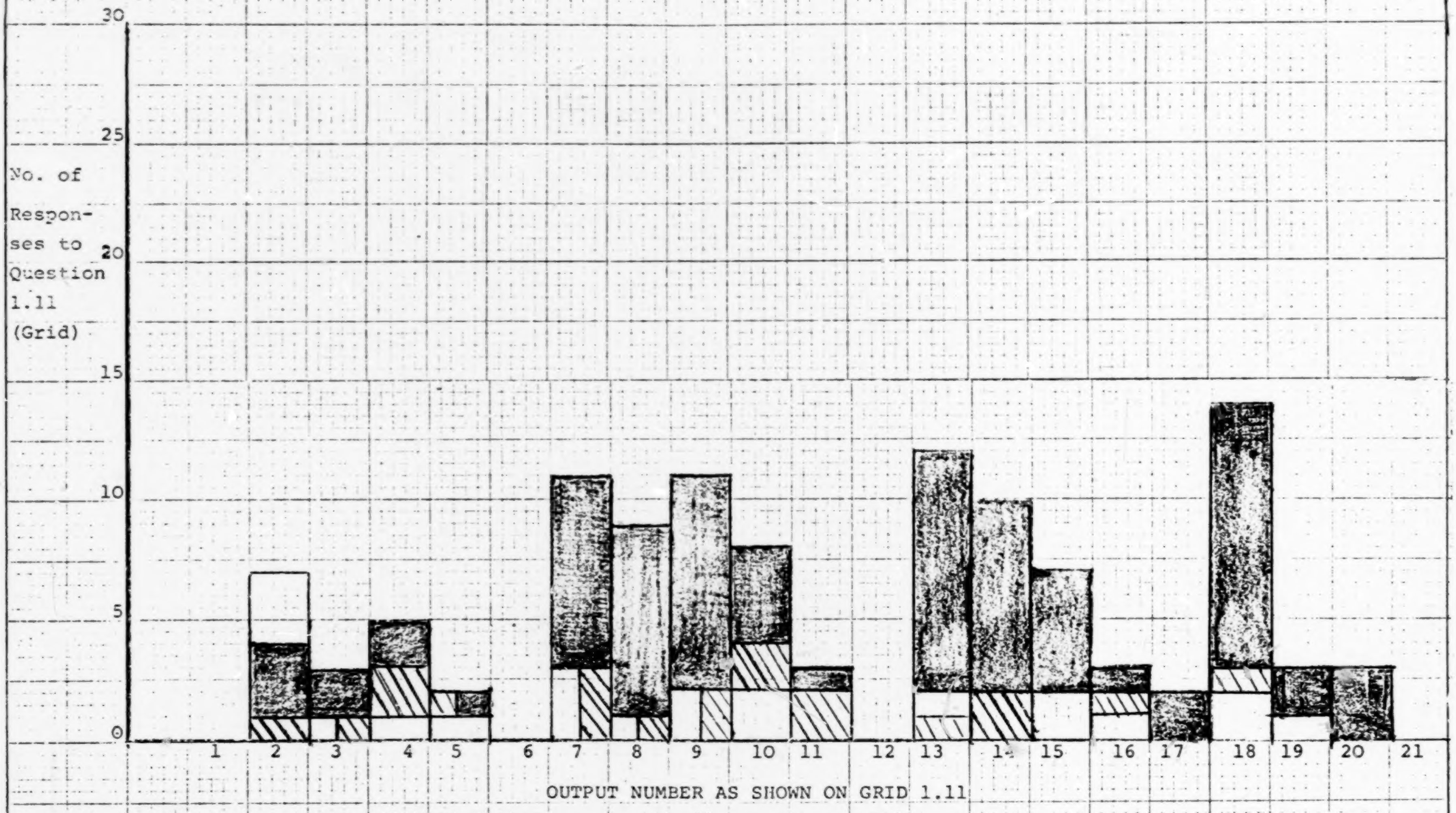
CHART NUMBER 20. INPUT ITEM NUMBER 10. MANPOWER COST DATA TOTAL MANUAL



OUTPUT NUMBER AS SHOWN ON GRID 1.11

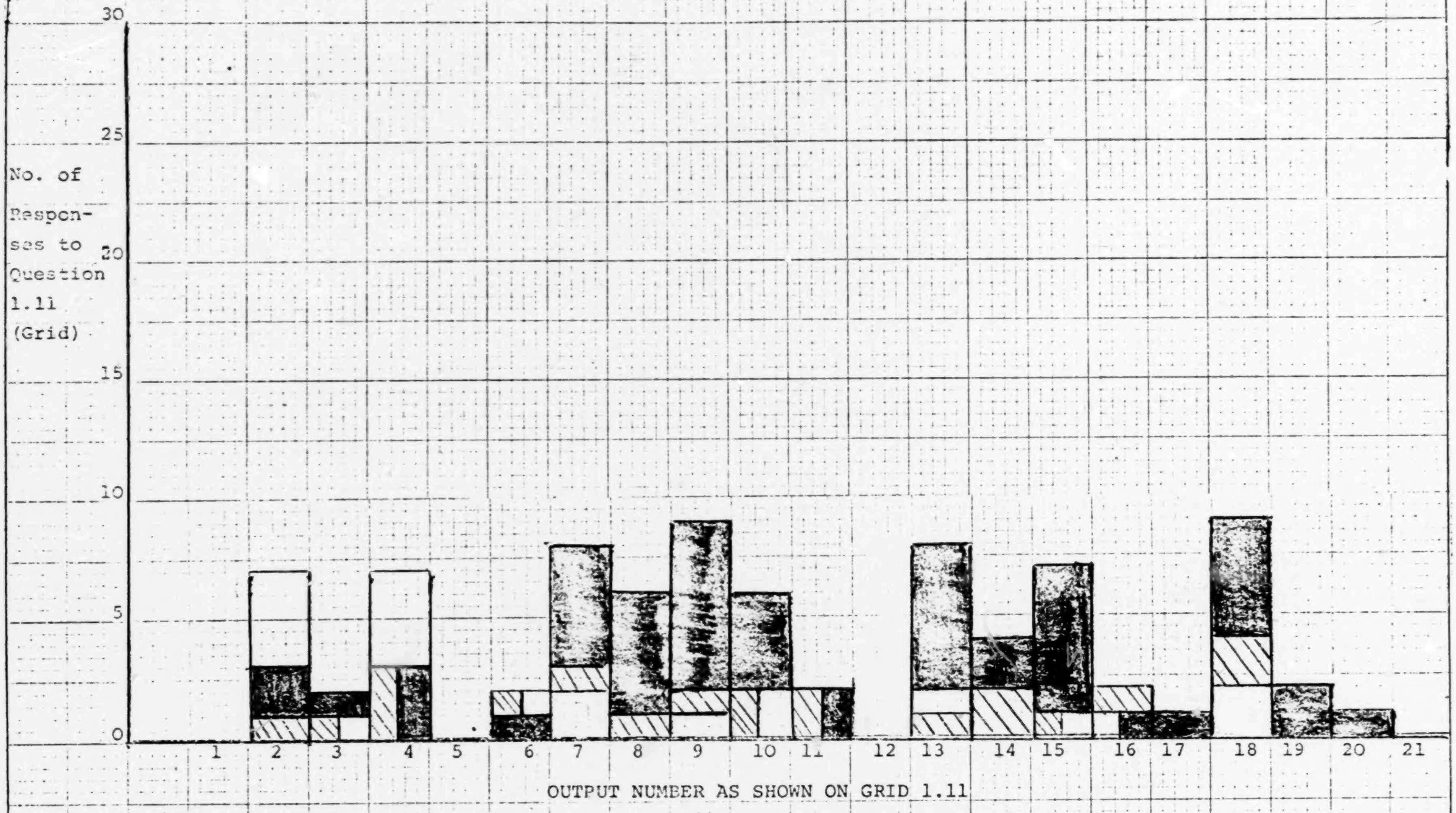
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 21. INPUT ITEM NUMBER 11. TRAINING DATA TOTAL STAFF



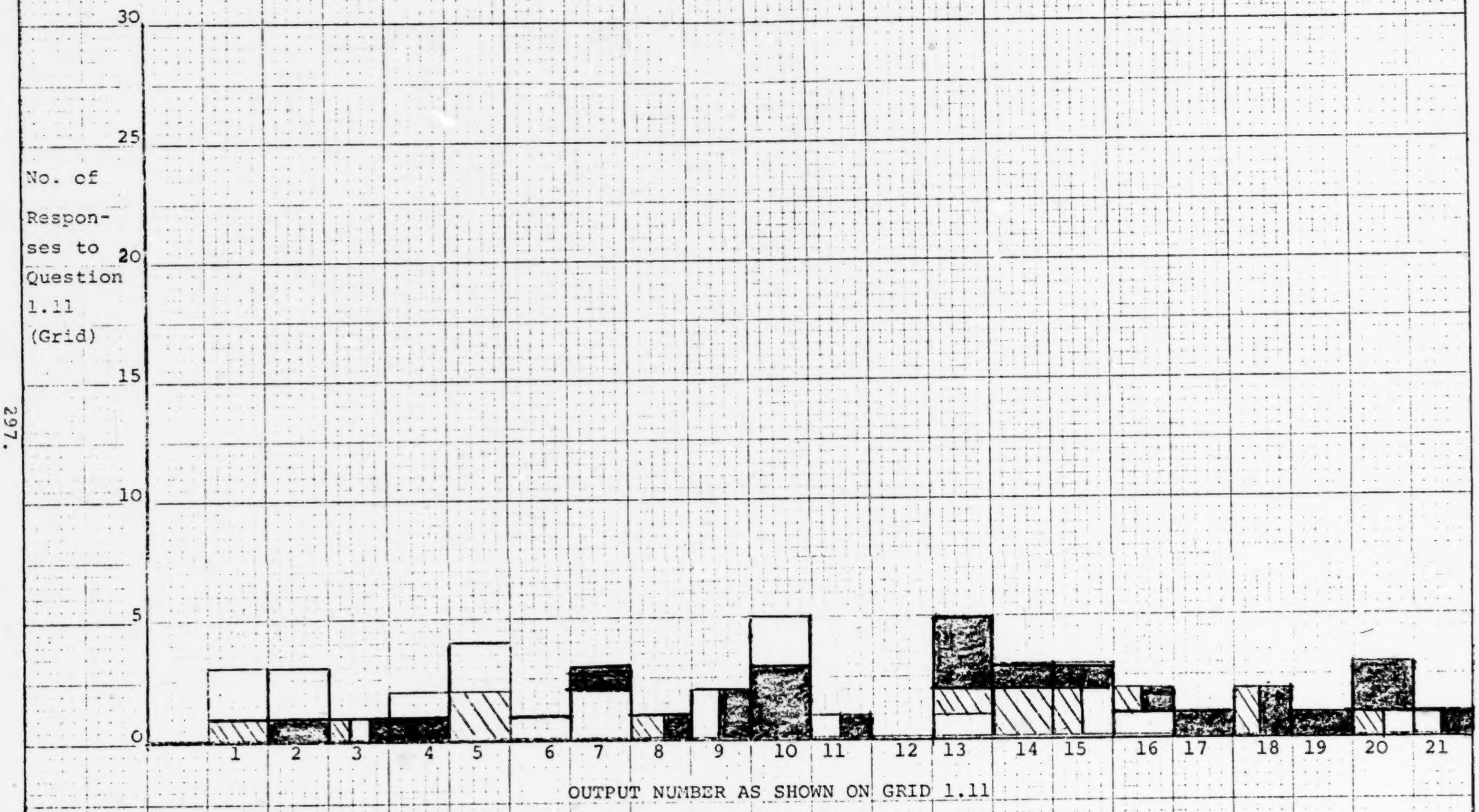
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 22. INPUT ITEM NUMBER 11. TRAINING DATA TOTAL MANUAL



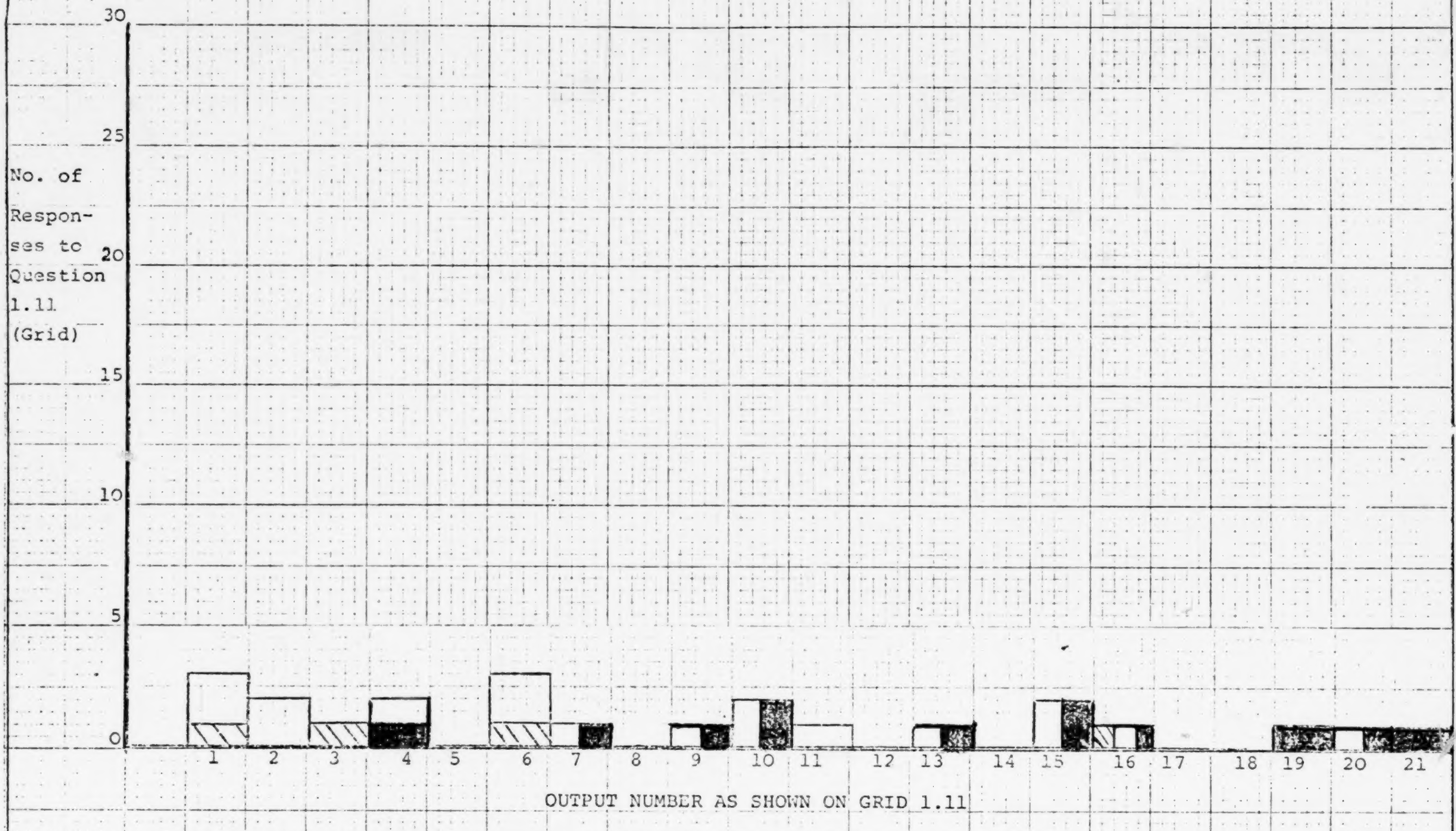
DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 23. INPUT ITEM NUMBER 12. OTHER SPECIFICATION. TOTAL STAFF



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

CHART NUMBER 24. INPUT ITEM NUMBER 12. OTHER SPECIFICATION TOTAL MANUAL



DISTRIBUTION OF RESPONSES BY OUTPUT - USE OF INPUT

QUESTIONNAIRE II

International Study into the Development of Extended Applications of Electronic Data Processing in Personnel Management and its implications on Labour Markets.

1. Concept

1.1 What were the principal reasons for deciding to investigate and subsequently install a computer oriented personnel system?

1.2 Did you aim ultimately to achieve total company systems integration?

1.3 Did you foresee and include in the planning any special negative management attitudes that would have to be overcome?

1.4 Did the organisational structure impose any constraints in the design of the system? If so, was the structure altered?

1.5 Did you plan to alter the structure and/or reporting responsibility of the personnel department? If so, in what way?

1.6 Was the decision to proceed based upon economic savings or value judgement concerning effectiveness and flexibility of personnel transactions?

2. Pre-Planning

2.1 Did you think of the costs involved and how did you determine the costs? Please specify.

2.2 What functional areas and/or operating units contributed to the determination of data to be held?

2.3 Who determined the whole range of categories of input and what priorities were allocated?

2.4 What were the main determinants of output and what priorities were allocated?

2.5 Did external requirements have any influence in determining input/output? If yes, please give examples.

2.6 Did you have any problems in the co-operation between personnel and systems staff? If yes, what problems?

2.7 Did the physical location of operating units of the organisation have any influence in determining input/output?

2.8 Did the organisational structure have any influence in determining input/output?

2.9 Did the trade unions and/or works' council have any influence in the input/output of the system?

2.10 Coding structures:

- Were all coding frames devised internally?

- If coding frames were devised internally, did external influences have any effect on the final frame?

- If coding frames were not devised internally, where were they obtained? Were these modified in any way?

2.11 Were the planning activities and systems of other functions such as finance, production, marketing taken into account during systems design?

2.12 To what extent and in what way did the computer manufacturer assist in the design of the system?

2.13 Did reporting requirements to a higher headquarter unit have any influence in the design of the system? To what extent did these requirements affect reporting relationships?

2.14 To what extent were personnel policies, rules and procedures changed or developed in light of the EDP-planning? Please give examples.

2.15 If you are now in the stage of developing a new EDP personnel information system or large part of the existing one, how are you organising the project now?

In what way have you changed the organisation of the work due to past experiences?

2.16 How did you sell the system and to what levels within the organisation?

3. Implementation - Installation

3.1 During implementation did you undertake a Pilot run in a small department? If so, to what extent did these results cause changes in the systems design?

3.2 What were the main reasons for determination of reporting cycles? To what extent were these determinants external to the organisation?

3.3 What were the main difficulties encountered in installation? Please comment at least under the following headings:

- hardware
- software
- trade union acceptance
- other functional/managerial acceptance
- accuracy of data
- timeliness of receipt of input
- usability of output
- interface with other systems
- shortage of system personnel (programmers) or general lack of time at the EDP-department.

3.4 How long did the system run parallel with the extent manual or EDP-system?

3.5 To what extent did the parallel operation occasion change or modifcation to the system as designed?

3.6 To what extent were the personnel policies, rules and procedures altered in light of the Pilot run and/or parallel running results?

3.7 To what extent were coding frames altered in light of the Pilot run and/or parallel running results?

3.8 Did the results of the Pilot run/parallel occasion alteration of input/output design? If so, were there any major changes to the use for which the system was initially conceived and designed.

4. Operation

4.1 Did you have an on-line-system? If not, when d you update your files and how?

4.2 What difficulties were encountered during the transcription of relevant personnel data? How did you make the data available? Please comment in terms of at least the following :

- availability of initial data and how did you make the data available
- ability to keep data current
- timeliness of reporting
- co-operation by reporting units
- recording of confidential personal data

4.3 Have you attempted to put on historical data from the pre-system time? For how long time do you store data?

4.4 Has the system performed the tasks that it was designed to do? (e.g. manpower economics). In what specific areas are you satisfied and in what areas are you not satisfied?

4.5 Which kind of retrieval flexibility is built in the system?

4.6 Has the system in fact proved flexible enough to accommodate planned changes or additions to input/output?

4.7 Do you consider that you will have to change your equipment configuration to meet proposed changes or additions to input/output?

4.8 What subsequent changes in the reporting relationships and decision making vis a vis personal department, other functions and operating units occurred that were not foreseen during the planning stages?

4.9 Did you experience any change as to the centralisation or decentralisation of the personnel functions within the company?

4.10 Did these changes come about as a direct result of the functioning of the system? If so, to what extent did structural changes follow?

4.11 Do or did managers in receipt of output respond in a positive fashion to the data provided? If they did not respond, how were alternate decisions taken and what was the source of the information?

4.12 If the managers did not react or respond to data provided by the system, was it because of :

- lack of relevant data
- incidences of out of date data
- bad presentation of output
- incorrect data
- other

4.13 From the grid in question 1.11 of the Part 1 Questionnaire would you please give as many details as possible on the positive use and advantages of those items shown as "C"-items.

4.14 How do you maintain accuracy of the input data shown in the grid?

4.15 Have you found that in using the output there have been changes in the input method? If so, would you please comment upon the major changes and the reasons therefore.

4.16 Which personnel policies, rules and procedures have been changed or developed in light of operational experience?

4.17 Is your personnel EDP-system integrated with your corporate planning system?

4.18 Is your EDP-system integrated with the accounting system and/or with other functional systems?

5. External influence

Note: The subsequent questions are an attempt to determine how your system was designed to accommodate extra firm requirements and influences. Therefore some questions will to an extent seem repetitive; however, the answers should be given in the context of exogenous circumstances.

5.1 Does your system provide for reporting to external agencies? (e.g. government agencies, employers' organisations, training boards).

5.2 If so, were these reporting requirements considered during the design? If not, how do you achieve such reporting in terms of those external requirements?

5.3 Do you exchange data, file structures, system design with other companies? Government agencies or employers' organisations? If so, to what extent?

5.4 Did you co-ordinate or liaise with other companies, government agencies or employers' organisations in the structure of your coding frames? If so, were you able to achieve compatibility with those external structures?

5.5 Did you attempt to exert any influence on government agencies to assist in the formation of their coding frames? If so, in what specific areas?

5.6 Are you required to record data that is not meaningful in your own organisational terms?

5.7 Did your collective agreements have a significant influence and vice versa on :

- system design
- input
- output
- coding frames

5.8 To what extent is your system designed to facilitate collective bargaining? What specific input/output items are used?

6. Forward planning

6.1 To what extent do you want to extend co-operation and co-ordination of system design and coding structures vis a vis

- other companies
- educational institutions
- government agencies

- employers' organisations
- employee's organisations

and the enterprise?

What are the major constraints?

6.2 What form do you think this co-ordination should take?

6.3 What role do you feel computer manufacturers should take in designing compatible systems and coding structures?

6.4 Can the computer manufacturers give more assistance as to software?

6.5 To what extent do you feel that different internal EDP-system output ought to be mutually dependent?

6.6 What future role do you foresee personnel management taking in the decision making of the enterprise?

6.7 If you visualise an upgrading of the status of the personnel function, to what extent do you attribute this development to EDP activities?

THE CASE STUDIES - An Analysis

By: B. Linder and
J.E. Bayhylle

This part briefly summarises the eight case studies and gives a comparative analysis of the results.

The object of the case studies was to describe in greater depth how the firms have come to use computer technology for personnel administration. These cases have been developed by questionnaire and interview. Most of the interviews were held with representatives of top management, personnel departments, data processing departments, planning departments, line executives and works councils or similar bodies. As a rule the interviewing work took about one week to perform. The first case study was completed in October 1970 and the last in October 1971.

All studies more or less follow the outline below:

1. Description of the firm
2. Reference points, goals of the EDP work
3. Planning stage
4. Introduction/installation
5. Operation
6. Relations with the environment
7. Plans for the future

In those instances where the companies were in a development stage as regards the planning or installation of a second or third generation of personnel data systems, the "obsolete" systems have been described rather summarily. The emphasis has been put instead on a description of the plans and the development efforts which are now in progress.

Any reader who is interested in the specific problems which characterise (say) a certain industry, or who wants more technical information, can therefore profit from studying the appropriate case description.

A brief description of the eight cases is given below in the order of their presentation in Chapter III.

1. Hamburg Power Company - Germany

The Hamburg Power Company employs about 5,700 persons. It delivers power and heat to the city of Hamburg and adjoining areas in Schleswig-Holstein.

The enterprise is centred on Hamburg and is not affiliated with any subsidiaries or parent company.

This study describes a data system that as been in operation since 1964 as well as development tendencies.

2. Ford - Germany

German Food employees about 47,000 persons and grosses about 2,500 million DM per annum.

Ford Verk AG in Cologne, as part of Ford of Europe Inc., is an overseas headquarters company under the Ford Motor Company at Dearborn, USA. From Cologne the firm controls several entities in Germany and one in Belgium.

For the most part this study describes an integrated, on-line personnel data system.

3. Siemens - Germany

Siemens AG employes about 200,000 persons. It manufactures sections for construction material, computers, power-plant, electrical fittings and equipment for medicine and communications.

This study, carried out at Siemens AG in Munich, describes the development of an integrated personnel data system.

4. SAAB AB - Sweden

This group of companies employes about 27,000 persons and grosses annual revenues of about 3,000 million Swedish kronor.

Principal lines of manufacture: automobiles, aircraft, missiles, computers and process control systems.

Head office in Linköping, which administers several plants in Sweden and some ten foreign subsidiaries.

The study consists of two parts: first, a description of the present data system embracing the 7,800 or so employees who work in Linköping; and second, a description of ongoing development projects which aim at a total management information system (MIS).

5. Credit Lyonnais - France

The largest State-owned bank in France, with about 38,000 employees working in 2,000 offices. Head office in Paris. A large part of the banking operation is put on computer.

This study describes the development of a personnel data system that Credit Lyonnaise installed in 1968.

6. Philips - Austria

Philips Austria employs about 9,000 persons and transacts annual business of about US$ 150 million.

Its principal product lines consist of tape recorders, cassette tape recorders, video tape recorders, dictating machines, TV sets and lady-shavers.

The head office in Vienna co-ordinates the operations of six manufacturing plants in Austria.

This study describes a personnel data system covering all employees.

7. Esso - Great Britain

Esso UK employes about 11,500 persons and grosses annual revenues of £600 million.

Its business comprises a large tanker fleet, two refineries, a distribution network of major terminals, bulk plants, service stations, pipelines, a research laboratory and a central-heating installation subsidiary.

Head office in London.

This study is concerned with the development of an inte-rated pay-personnel data system, with emphasis on personnel planning.

8. Civil Service - Great Britain

This is a newly established government department which among other things is called upon to devise and administer a common personnel policy and to render consulting services to other departments in related matters.

This study describes the planning of an on-line integrated pay-personnel information system.

Results

Each case can be said to account for problems that are specific to the firm in question with regard to such questions as making adjustments to that firm's specific determinants, i.e. system content and applications. On the other hand, it is quite clear that where the general application of EDP is concerned - in other words, the reasons for using EDP, experiences gained, consequences for the personnel function, successive development etc. - the cases are very much identical and well suited to being studied in parallel.

In the remainder of this section, therefore, we shall attempt to analyse the common and generalisable experiences.

General development tendencies

We shall first describe the successive development of personnel data systems from the time they first came into use, which seems to have been during the early 1960's, up to the most sophisticated approach that is reported upon.

It appears from the cases that it would be appropriate to make such a temporal classification in the following steps. We shall also highlight each step with examples from the various cases.

Step 1

Mechanisation of existing personnel administration routines.

Step 2

Additions to step 1.

Step 3

Total revision of existing systems with a view to integrated personnel information systems.

Step 4

Integration of the personnel information system with other internal and external information systems which aims at totally integrated management information systems.

Step 1 Mechanisation of existing personnel administration routines

The introduction of computer technology into a company is characterised usually by similar starting points. These are summarised briefly as: Personnel administration routines which function in certain ways: organisationally, functionally and as instruments of personnel policy. Certain routines are "information-laden" in the sense that huge quantities of data have to be processed periodically. While this observation holds particularly true for payroll calculations, it also has validity in some instances for the maintenance of personnel records.

Thus, the use of EDP entailed the mechanisation of existing routines which in no essential way altered the framework of organisation, function or personnel policy. In other words, EDP was used to carry out the same work but to do so more speedily, accurately and cheaply.

It should be noted that the development of software (systems or programs) does not always proceed in parallel with the development of hardware. It is difficult to decide what is cause and what is effect. A question that is fundamental is whether the machines are improved in response to the actual requirements of users (i.e. do the information needs of firms bring pressure to bear on the development of computers?), or, whether increasingly sophisticated machines necessitate and make possible a development of the information system.

Even if the question cannot be simplified into either-or terms, it appears from the cases as though advances in hardware have been highly instrumental in promoting the development of corporate information systems.

The foregoing is at least true of step 1 in the development process, and for a good reason: the very fact that the firms already command a data processing facility enables the personnel department to make use of it, too.

From Philips, for example, we can taken an example of very general and realistic objectives where the use of step 1 is concerned:

"1. Data volumes had increased heavily because of the expansion of the company.

2. EDP would provide a possibility of getting faster data handling, better uniformity in calculating wages within the Philips Group and at the same time better and safer statistics on salary development etc.

3. A certain difficulty had been noticed regarding employing and keeping personnel at the salary departments."

Basically, the same reasons were advanced by the Hamburg Power Company, though with the specification that the object was to reduce the number employed in the payroll office from 50 to 20. All the firms investigated began their EDP development by mechanising the payroll routines, and for most of them this continues to be the principal application.

A very interesting departure from this general step 1 development with mechanisation of payroll routines is reported by Esso Petroleum.

Esso installed a computerised system for paying out wages and salaries in the early 1960's. While this system was in operation a small task force, the Manpower Planning Group, worked from 1964 to 1967 on a completely lateral system of information for personnel planning purposes.

This project was of a more experimental nature and was co-ordinated but not integrated with the payroll system or with the firm's other planning systems. It also appears that the planning group was more advanced and forward-oriented in its thinking that was considered realistic at the time. In other words, their work was not anchored in any manifest needs among the users - the line executives. However, the experiences that were gained have greatly facilitated the development of a new and more integrated information system.

Wherever the actual effort to develop a computerised payroll system has succeeded, it has been organised so as to provide for (1) a reference group including representatives of the users; and (2) a smaller working project group with representatives from both the data processing departments and accounting/personnel departments. Another general experience is that the work becomes a good deal easier if the project group is given the opportunity to devote full time to it. It may now be asked: How well have the goals set out for step 1 been met?

We found that the goals of "speed" and "accuracy" are consistently attained. A somewhat more complicated picture emerges in regard to the cost savings. As a rule it emerges that fewer people are needed to man the payroll offices. However, this saving is often eroded by cost increases elsewhere, i.e. by increments to staff at the data processing department plus the costs incurred to run and maintain the programs. Be that as it may, economies have still been achieved, largely for the following reasons :

1. Labour costs are superseded by the costs of leasing or buying a computer. Since the latter costs do not rise as rapidly as labour costs, the data system becomes relatively cheaper and cheaper.

2. The data system can absorb a growing amount of information without incurring major costs. Ford, for instance, reported that it managed to extend the coverage of wage and salary administration to 10,000 more new employees with no increments of manpower to its personnel or data processing department.

3. It is possible to retrieve more and more information from the system at no greater added expense. Firms reported economies by stating that although the costs have not declined, the amount of information obtained has increased enormously.

A recapitulation of step 1 shows the following:

Organisation of the personnel/ accounting function.	Unchanged except for some reduction of payroll office staffs.
Personnel policy	Unchanged excepy for detailed rules pertaining to wage and salary administration.
Applications	Payroll routine first and foremost.
Machine Use	Utilisation of existing machines. Machine capacity and potentials not harnessed fully.
Systems design	Mechanisation of existing routines.

Economy	More, speedier and more accurate information at unchanged or reduced operation cost. (Assuming the hardware exists for other users).
Critical factors	Availability of skilled systems personnel. Defining goals that are realistic in relation to user needs.
Position and status of the personnel function	Unchanged.
Organisation of systems work	Reference group + project group, perhaps working full time (systems men + specialists in personnel/ accounting administration).

Step 2 Additions to step 1

To take an example under this heading, a computerised payroll system is often successively enlarged in that maximum output is derived from existing input. This means that systems are added for such things as pay statistics, other personnel statistics, budget control, forecasts of manpower separations and recruitment, etc.

In common with step 1, organisation of the personnel function and the makeup of personnel policy constitute constraints or determinants that are not affected. Hence that which takes place under this step is to make maximum use of the existing data system as well as the existing hardware. The additional information is drawn upon to provide: (1) direct communication to line executives; and, (2)a data base for planning within the personnel department.

For the most part this work proceeds step by step and is initiated by those who are responsible for the maintenance of existing systems. The experiences indicate that the systems work, when combined with (say) the introduction of a computerised payroll system, reaches a very noticeable peak immediately before and even after the actual installation. Besides, no little maintenance work is required for a long time after the installation; indeed, such work is one of the fountainheads of the practical ideas that can be applied to developing and enlarging the system.

Hence, in planning the deployment of resources to systems work, the provision of resources for a long period after installation may also be recommended. A clear-cut allocation of responsibility for systems maintenance, preferably to one or more persons who are committed on a full-time basis, seems to be necessary in order to benefit from the gradual increments to efficiency which characterise step 2.

SAAB offers a practical case in point with very general implications. Its operative system is specifically based on the idea of successive enlargement.

The first task undertaken at SAAB was to analyse the output requirement. This led to a description of six reporting domains as follows:

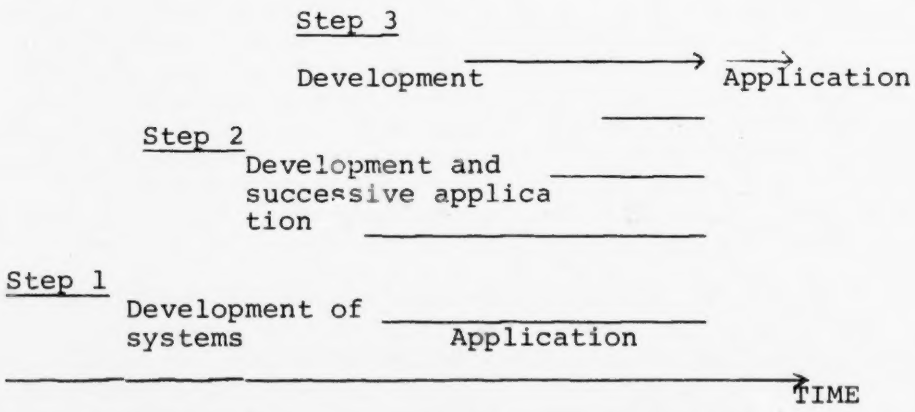
1. Personnel records
2. Payroll calculation and accounting
3. Rate-setting and pay statistics
4. Personnel budget follow-up
5. Personnel statistics
6. Other reports of personnel data

The requirements of external users are included in this analysis.

The input that would be required for the six domains was defined in a second step. Next, detailed systems, programs and other material were prepared primarily for purposes of implementation under domains 1 and 2, i.e. personnel records and payroll calculation. So by the time these domains were installed there existed both a capacity and plans for a successive expansion.

It appears from the cases that few firms have been in a position to finish off step 2. Owing to advances in hardware and a reorientation as regards the role of personnel administration in the firm, data systems quickly tend to become out of date. The possibilities for enlarging upon existing systems therefore becomes very limited; instead, we found that when a firm was running and maintaining one system, it was engaged intensively and simultaneously in the development of a new, more complete system.

The development may be described schematically as follows :



The long development period, in combination with the ever shorter service life of data systems, leads to a constantly ongoing work of maintenance, enlargement and development at various levels, with the different systems leapfrogging.

The obsolescence of steps 1 and 2 has been reported as follows :

1. Standard programs for output data with fixed running times, in combination with the shortage of systems men, make it necessary to do additions manually.

2. Output data come too late to permit their use as a basis for decision-making.

3. Most systems do not have the flexibility that is needed to permit rapid updating, e.g. in connection with reorganisations, or to be fed with change codes so as to make possible a comparison over time.

4. Unforeseen questions addressed to the data bank cannot be answered unless very substantial resources are expended on programming. (i.e. little are of high level enquiry languages and routines).

A recapitulation of step 2 yields the following picture:

Organisation of the personnel function	Unchanged.
Personnel policy	Unchanged except for detailed rules.
Applications	Payroll rouintes + e.g. pay statistics, personnel records, personnel statistics, rate-setting, budget follow-up = a data base for follow-up and planning.
Machine use	Efforts to make maximum use of existing machines.
Systems design	Successive additions to existing systems.
Economy	More and more highly defined information at insignificantly higher cost.
Critical factors	A clear-cut responsibility for maintenance and additions, preferably assigned to a full-time project group. Spare capacity in existing systems.

Position and status of the personnel function	May be changed in consequence of (1) the greater weight attached to personnel matters in general; (2) greater access to information within the personnel department.
Organisation of the system work	Smaller project group.

Step 3 Total revision of existing systems with a view to integrated personnel information systems.

The determinants of this "second generation" of data systems differ essentially from the ones given earlier.

The object now is to achieve a single information system rather than to mechanise existing routines. The intent is to have the information serve management and the personnel department as a data base for decision-making.

In many cases the design of the system will call for a thorough-going and unbiassed analysis of the personnel function as such. In other words, information needs have to be charted for different kinds of decisions, as in personnel budgeting, hiring, training, promotion, transfer etc. In that way a picture of the whole will emerge that can be transformed into plans.

The motives and objectives that go into these step 3 projects may be illustrated by quoting from the Siemens study:

"1. Provision of aids to decision-taking
2. Provisions of aids for decision-taking on questions of principle
3. Rationalisation of personnel administration."

Ford has formulated similar goals for its new personnel information system:

"1. The highest possible degree of mechanisation for purposes of rationalising the work of personnel with, at the same time, extensive machine control.

2. A uniform system for all categories of those employed, management personnel, employees under wage-agreements and others, and the workpeople.

3. The supply within the shortest time of comprehensive information for purposes of personnel management and personnel planning.

4. Flexibility in programming and in output.

5. The system to be designed and constructed in such a way as to form a possible component of a management information system."

It follows that organisation of the personnel function as well as personnel policy in the large companies no longer constitute rigid constraints, but instead are influenced to a high degree by the information systems.

At Credit Lyonnais it has been possible to centralise the personnel function after bringing computer technology into use.

The projects are consistently well-planned in relation to concrete sub-goals, where installation is thought of as being implemented in different stages.

Ford identifies four phases:

1. Collection and checking of personnel data
2a. Collection of timings
2b. Payroll calculation
3. Planning of training and its control and analysis
4. Personnel planning

Siemens has a project plan which extends over the years 1970 - 74, with provision therein for four successive installations.

Apart from periodic production of a predetermined kind, advances in hardware now also permit direct access through terminals. The case studies for the Civil Service Department and Siemens go at length into how the problems of engineering and systems design are being solved.

At the present time (that is during the study period - 1971) none of the case study companies have managed to penetrate very far into step 3. Plans have only crystallised in one instance, and in a few instances perhaps a first installation has been made. It is therefore too early to report on any direct experiences of operational systems.

But to judge from the actual project work, it appears that certain conditions should be fulfilled in order to make the work easier.

1. Top management is kept fully informed and has given support and resources to the project in successive decisions.

2. The project is planned to meet concrete sub-goals within the framework of a comprehensive view.

3. A clearly defined group of personnel and systems specialists are given the opportunity to devote full-time to the project.

4. The system will improve in accuracy if the users

are made responsible for input, i.e. the receiving departments at the lowest level.

Step 3 may be recapitulated as follows :

Organisation of the personnel function	May be changed to a considerable extent.
Personnel policy	Must be specified. May be programmed where applicable to (1) control decisions from the machine; (2) answer questions.
Applications	In principle the entire personnel function.
Machine use	On-line system with data bank and terminals.
Systems design	Integrated system for (1) day-to-day routines and (2) an information base for taking decisions. Permits direct access.
Economy	The project plans contain estimates on costs of development, operation and maintenance. Indirect gains are achieved in the form of better corporate management.
Critical factors	Availability of high-calibre project group with experience of existing personnel data systems. Support and interest from top management and users.
Position and status of the personnel function	In most cases accorded very great weight before step 3 commences. Better integration between the personnel function and the rest of the firm. Enhanced opportunities for influencing decisions at all levels.
Organisation of the system work	Project group working full-time + reference groups. Successive installation of reporting domains.

Step 4 Integration of the personnel information system with other internal and external information systems which aims at totally integrated management information systems (MIS)

It may be inferred from the foregoing that none of the firms investigated have reached this final link in our development chain, which will have to be seen as a remote and perhaps not realistic goal. Those firms which directly state that the application of systems in step 3 aims at a more comprehensive MIS admit to substantial doubts about the future prospects.

Hence there are no direct experiences to highlight. On the other hand, there are many factors which clearly indicate that the course of events is headed towards MIS.

For instance, it is striking to note that many of the more sophisticated step-3 systems are also self-contained personnel administration systems. Thus very limited interfaces are reported between the personnel data system and other internal and/or external systems as regards both input and output. Input still consists for the most part of individual and pay data, and as such excludes such things as corporate plans and labour market information. Moreover, output from the personnel data system goes directly to line executives and there is hardly any interface in the sense that such output forms the input for other systems. Hence, there are signs of significant development in this direction. e.g. Esso - links with corporate planning, salary administration, management development etc. SAAB are clearly contemplating such advances. Exceptions to the foregoing are of two kinds: (1) interfaces between the firm's payroll-calculation and financial reporting systems; and (2) interfaces between the firm's pay reports and tax returns and external users such as internal revenue authorities, insurance companies and pension trusts.

It may therefore be foreseen that step 4 will involve further integration of two kinds:

1. Within the firm, increased co-ordination between diverse information systems (personnel, accounting, marketing, manufacturing and other functions) leading towards integrated corporate planning.

2. Between the firm and the external environment, a greater exchange of information. One field of relevance to this study is the need to exchange information that arises between the firm and the labour market authorities. An increasingly refined system of internal personnel planning presupposes access to relevant data from these authorities. But that in its turn presupposes that the labour market authorities are regularly furnished with information from the firm. If this never-ending process of information exchange is to get under way at all, it will be necessary to devise compatible codes and classification systems.

It appears from various other studies that several countries have begun projects to develop codes and classification systems at the national level. There is a very great need for other countries to do likewise. (Especially see Annex II).

QUESTIONNAIRE II - CASE STUDY COMPARISON (Excluding U.K.)

CREDIT LYONNAIS	PHILLIPS	FORDS	SAAB	HANBURG	SIEMENS
CONCEPT 1.1 Total re-organisation to strengthen centralisation & increase efficiency.	1.1 Increasing vol. of data + faster data handling + greater uniformity in wages calculation + better states + staff turnover in salary dept.	1.1 Old system insufficiently flexible for decentralisation of sections + maintaining & guarding data flow difficult + increasing vol. of data-, collecting + processing + output + updating difficult. Decreasing reliability + couldn't keep up with demands on it.	1.1 To provide faster + more efficient data bases to take decision on + to be able to draw intra/extra firm comparisons.	1.1 Already had equipment to take over pay data so could be more efficient/reduce staff/give more up to date information.	1.1 Provide aids to personnel decision making & also for decisions on questions of principle.
1.2 NO	1.2 NO	1.2 NO	1.2 -	1.2 NO	YES
1.3 Question didn't arise.	1.3 -	1.3 -	1.3 -	1.3 -	Muddle management doubts had an effect on planning.
1.4 NO	1.4 NO	1.4 Only insofar as a section set up to supervise & further dev. system.	1.4 -	1.4 NO	1.4 NO
1.5 Change in organisation + routines.	1.5 NO	1.5 NO	1.5 -	1.5 Being planned separately.	1.5 Change in individual activities in personnel.
1.6 Value	1.6 Value	1.6 Value + little econ.	1.6 -	1.6 On both.	1.6 Largely value.
PRE-PLANNING 2.1 Concentrated on system, not cost.	2.1 -	2.1 Cost considered but pre-development investigations found it difficult to make precise estimates & decide how to allocate them.	2.1 Not really.	2.1 Not really.	2.1 Detailed estimate.
2.2 Personnel + Wage + Salary Admin. operating units some importance.	2.2 As for C.L.	2.2 As for C.L.	2.2 Mainly personnel. Sole line comment.	2.2 Personnel + welfare.	2.2 As many depts. & sections as possible. Personnel + manufacturing.
2.3 Personnel + special project group.	2.3 Personnel + project group.	2.3 Development team decided data to be collected. Scope of categories detd by output required and priorities by what system could cope with.	2.3 -	2.3 EDP determined categories, priorities fixed by personnel.	2.3 Largely determined by output wanted. Priority to material going up to management & specific one-purpose presentations going down.

CREDIT LYONNAIS	PHILLIPS	FORDS	SAAB	HANBURG	SIEMENS
2.4 Priorities = development of central register of employees + standardisation of personnel data + centralisation of data.	2.4 Priorities = payroll information for banks + detailed expenditure list for internal accounting + provide base for official contributions.	2.4 Output required determined by Dept. Heads. Priority list worked out on basis of output required.	2.4 -	2.4 Personnel + welfare according to their needs: calculation + accounting + stats + information.	2.4 Mainly determined by personnel requirements. Top priority = personnel accounting.
2.5 NO	2.5 Legal requirements.	2.5 Legal requirements + those arising out of wage agreements.	2.5 Into parties entitled to on basis of law/contract/agreement.	2.5 Very little.	2.5 Sohe-goot agencies.
2.6 -	2.6 -	2.6 Very successful teamwork.	2.6 -	2.6 NO	2.6 NO
2.7 NO	2.7 A little (?)	2.7 NO	2.7 -	2.7 -	2.7 YES
2.8 -	2.8 -	2.8 NO	2.8 -	2.8 A little.	2.8 YES
2.9 NO	2.9 NO	2.9 NO	2.9 T.U. comments at final stages.	2.9 NO	2.9 NO
2.10 YES - NO. -	2.10 YES - partly ^{4}/250 codifications from external sources.	2.10 YES - NO -	2.10 NO. Largely used centrally developed systems which they were instrumental in devising.	2.10 YES - NO.	2.10 YES
2.11 NO	2.11 Input/output adapted to demands from finance and accounting functions.	2.11 Some considerations paid to payroll calc^{ns} under Finance Dept.	2.11 Not really. Only interface where integration of payroll calculation with cost accounting and budgeting.	2.11 NO	2.11 YES
2.12 No assistance.	2.12 Provided small sub-routine only from soft-ware stock.	2.12 Only in machine layout.	2.12 Only by contributing a standard tax calculation programme.	2.12 NO	2.12 NO
2.13 NO	2.13 Not really.	2.13 NO	2.13 NO	2.13 NO	2.13 YES, considerably.
2.14 Organisation and routines changed.	2.14 Affected wage and salary procedure.	2.14 Policy determined by parent Co. Local rules etc. examined and where necessary remodelled to suit ODP.	2.14 Changed a little.	2.14 Hardly any.	2.14 No change.
2.15 Continued development & improvement taking place.	2.15 -	2.15 Developing extension on lines laid down. Learnt by experience that cannot theoretically design a whole system & then bring it in on a fixed date.	2.15 Experience suggests, were far too ambitious, had to carry out modifications.	2.15 -	2.15 -
2.16 -	2.16 -	2.16 -	2.16 -	2.16 -	2.16 -

CREDIT LYONNAIS	PHILLIPS	FORDS	SAAB	HANBURG	SIEMENS
IMPLEMENTATION					
3.1 NO	3.1 NO	3.1 NO	3.1 NO	3.1 NO	3.1
3.2 Balance between keeping data up to date and limiting the No. of times computer used.	3.2	3.2	3.2 -	3.2 -	3.2
3.3 Delays in EDP Dept. as didn't have priority. Certain delays in reporting data - handling tables - checking delays.	3.3 Some lack of accuracy of data.	3.3 Shortage of systems personnel.	3.3 Obtaining input data at right time. Line management sometimes refused to accept output data they received. Shortage of systems staff.	3.3 Staff shortage.	3.3
3.4 Few months parallel run.	3.4 No parallel.	3.4 No parallel 3 months change-over period with some overlapping.	3.4 -	3.4 -	3.4
3.5 -	3.5 -	3.5 -	3.5 -	3.5 -	3.5
3.6 -	3.6 -	3.6 -	3.6 -	3.6 -	3.6
3.7 -	3.7 -	3.7 -	3.7 -	3.7 -	3.7
3.8 -	3.8 -	3.8 -	3.8 -	3.8 -	3.8
OPERATION					
4.1 Personnel registers up-dated 4x month. Wage registers 1x.	4.1 NO	4.1 YES	4.1	4.1 NO, 2x month regular up-dating service. 1x month check.	
4.2 No difficulties in transcription.	4.2 Confidentiality.	4.2 Confidentially + ability to keep data current.	4.2 None.	4.2 None	
4.3 No. 2 yrs usually.	4.3 Only that legally prescribed.	4.3 Limited amount 10-20Y.	4.3 Virtually none. 3 yrs.	4.3 NO: -	
4.4 YES	4.4 YES	4.4 YES	4.4 Yes, on whole.	4.4 Yes - stats could be better.	
4.5 Flexible on the whole.	4.5 -	4.5 Flexible.	4.5 Too rigid in some respects - timeliness fixed output data.	4.5 -	
4.6 -	4.6 -	4.6 YES	4.6 -	4.6 -	
4.7 -	4.7 -	4.7 NO	4.7 -	4.7 NO	
4.8 -	4.8 Line management managers order stats information.	4.8 None	4.8 -	4.8 Centralisation.	
4.9 Stronger centralisation.	4.9 No formal change.	4.9 NO	4.9 -	4.9 Not really.	
4.10 Not really.	4.10 -	4.10 -	4.10 -	4.10 On whole, yes.	
4.11 -	4.11 YES	4.11 YES	4.11 Some doubt about stats.	4.11 -	
4.12 -	4.12 -	4.12 -	4.12 -	4.12 -	

CREDIT LYONNAIS	PHILLIPS	FORDS	SAAB	HANBURG	SIEMENS
4.13 -	4.13 -	4.13 -	4.13 -	4.13 -	
4.14 -	4.14 -	4.14 -	4.14 -	4.14 -	
4.15 NO	4.15 -	4.15 -	4.15 -	4.15 -	
4.16 None	4.16 -	4.16 -	4.16 -	4.16 None	
4.17 NO	4.17 NO	4.17 NO	4.17 NO	4.17 NO	
4.18 NO	4.18 NO	4.18 Virtually none.	4.18 Integrated with accounting system.	4.18 NO	
EXTERNAL INFLUENCES					
5.1 NO	5.1 YES	5.1 YES	5.1 YES	5.1 YES	
5.2 NO	5.2 YES	5.2 YES	5.2 YES	5.2 YES	
5.3 Provide info. on tax, insurance, pension.	5.3 NO	5.3 NO	5.3 -	5.3 NO	
5.4 NO	5.4 Not possible.	5.4 NO	5.4 Used centrally developed code.	5.4 NO	
5.5 NO	5.5 NO	5.5 NO	5.5 -	5.5 NO	
5.6 -	5.6 -	5.6 -	5.6 -	5.6 -	
5.7 NO	5.7 -	5.7 NO	5.7 Considered.	5.7 Very strong influence.	
5.8 - (N.B.: l'Association Professionelle des Banques role)	5.8 Not answered but question of relationship under consideration.	5.8 NO	5.8 Tried to incorporate demands of C.B. into systems design.	5.8 In part.	
FORWARD PLANNING					
6.1 -	6.1 Want it.	6.1 Individuality of systems.	6.1 In favour.	6.1 Co-op^n necessarily.	
6.2 -	6.2 National Committee.	6.2 -	6.2 Joint development.	6.2 Co-ordination run by E.A.10.	
6.3 -	6.3 -	6.3 Limited construction of systems & code.	6.3 -	6.3 -	
6.4 -	6.4 -	6.4 YES	6.4 -	6.4 NO	
6.5 -	6.5 -	6.5 -	6.5 -	6.5 -	
6.6 -	6.6 Upgrading of importance foreseen,	6.6 Increasingly more important.	6.6 Can't predict.	6.6 Increasingly imp.	
6.7 -	6.7 As above, EDP result not cause.	6.7 Increasingly more important, but not as a result of EDP.	6.7 Can't predict.	6.7 Upgrading but not as a result of EDP.	

N.B. The U.K. cases have been excluded from this chart because the nature of the investigation and the applications themselves precluded a yes-no answer to the questionnaire. The questionnaire however was issued as a guide to the interviewers.

ANNEX I

OUTLINE FOR INVENTORY ON "CO-OPERATION OF MANPOWER AND RELATED DATA AND CLASSIFICATION SYSTEMS.

BY: E. Kempf

ANNEX I

I. ACCOUNT OF PRESENT SYSTEMS

1. Definition

(a) Employment - evaluation and forecasting
(b) Unemployment - vacancies - job seekers
(c) Active population - breakdowns - forecasts
(d) Qualification - qualification levels
(e) Occupations - occupational profiles
(f) Activities and functions - job requirements
(g) Collective agreements - groupings under collective agreements
(h) Other relevant definitions in the area of manpower.

2. The Existing Data Systems For each:

(a) Original purposes
(b) Characteristics covered and breakdowns
(c) Aggregations and aggregation levels
(d) Limits for disaggregation
(e) Procedure (source of data, periodicity of recording and of aggregation, follow-up, data processing techniques e.g. EDP etc.)
(f) Classification system used (main criteria etc)
(g) Ways of adapting the classification system to economic, technological and social change (if any)
(h) Critical evaluation of data system (reliability, comparability, degree of achievement of original purpose, etc)
(i) Extent of links between various data and classification systems.

3. New Demands to Data and Classification Systems

In respect of:

(a) Observation and analysis
(b) Forecasting and planning
(c) Operations
(d) Accuracy and reliability
(e) Breakdowns in case of aggregation and disaggregation
(f) Periodicity of recording and aggregation and disaggregation
(g) Techniques of data recording and processing
(h) Empirical research as a basis
(i) Compatability

4. Analysis of Demands by Area (Planning and Operation)

(a) Enterprise
(b) Manpower Policy
(c) Employment Service (labour market observation, labour market forecasting, placement, vocational guidance)

(d) Short-, medium- and long-term economic forecasting and planning at the national, regional and branch level
(e) Educational planning
(f) Vocational education and training
(g) Collective bargaining
(h) Social security
(i) Revenue system
(j) Others

5. Actual Needs in Respect of Systematic Recording and Processing of Manpower Related Characteristics (by Area)

(a) Occupations
(b) Functions and activities
(c) Jobs
(d) Educational and training level
(e) Adaptation capacity
(f) Criteria for wage determination
(g) Others

6. The Present Classification Systems

(a) Account
(b) Original purpose
(c) Suitability to achieve this purpose
(d) Ranking of purposes
(e) Scope for links between the classification system

7. The Need for Links Between Data Systems and for Compatibility between Classification Systems (By Area)

(a) Geographical dimension
(b) Sectors, branches
(c) Labour related characteristics
(d) Analysis of needs of each area with particular reference to need for linkages and compatibility and to specific demands to respective data and classification systems.

II. CO-ORDINATION OF MANPOWER RELATED CLASSIFICATION AND DATA SYSTEMS

1. Required and Feasible Degree of Co-ordination

(a) Factors promoting co-ordination (by Areas)
(b) Potentialities and limitations of co-ordination (by various data and classification systems) with particular reference to determining factors such as legal regulations, international agreements, particular conditions of various areas into which data and classification systems are to be integrated such as manpower agencies and employment service, social security, education, in-plant training, collective bargaining etc.

(c) Practical problems and problems relating to data processing
(d) Past initiatives towards co-ordination and their results
(e) International demand

2. Main Characteristics of a Co-ordinated Data System and of a Co-ordinated Classification System

(a) Criteria for breakdowns
(b) Taking account of these factors in existing data and classification systems
(c) Periodicity of recording, aggregation and disaggregation
(d) Extent of linkage and compatibility
(e) Adaptive mechanisms for taking into account technological, economical and social change.

3. Determination of Master Data System and Master Classification System

(a) Analysis of existing systems viewed from main characteristics of a co-ordinated data system and a co-ordinated classification system.
(b) Master data system and related systems
(c) Basic principles for master classification system
(d) Required change in master system and in related systems

4. Requirements of Changeover to Co-ordinated Data System and Co-ordinated Classification System

(a) Exploitation of foreign material and approaches (e.g. in vocational research and in research on vocational occupation, classifications)
(b) Work programme for country
(c) Institutional provisions
(d) Methods of work

ANNEX II

SURVEY OF SOME ASPECTS OF MANPOWER INFORMATION IN THE U.K.

BY: A. Hersleb - Manpower
Planning Manager,
Esso Petroleum Ltd.

A BRIEF SURVEY OF SOME ASPECTS OF MANPOWER INFORMATION IN THE U.K.

> "Nothing more effectively achieves improvement in statistics than the attempt to integrate them into a single framework."
>
> \- Prof. C.A. Moser, Director of the
> Central Statistical Office,U.K.

INTRODUCTION

The U.K. probably has more statistical series and ad-hoc statistical studies about people than most countries, ranging widely in usefulness and reliability and on the whole not too well co-ordinated as regards methodology and compatibility. This arises from such factors as national attitudes, pragmatism, individualism, distrust of centralised government and fear of such unfamiliarities as the computer; from institutionalised ways of doing things; and perhaps above all from the relative autonomy of government departments and macro-institutions and agencies. Nevertheless, both the economy and national attitudes and aspirations are changing fast, and in the field of activity under discussion Britain is in many ways among the leaders in new thinking and activity. However, there are one or two weaknesses which could lead to a situation in which the U.K. remains handicapped as regards manpower information essential to the efficient management of national resources, and finds itself falling behind in informational resources and methodology.

AREAS OF ADVANCE

There are a number of areas in which Britain is in the forefront or in which national problems are enforcing hard thinking and effort.

1. There has been a widespread development of awareness in both public and private sectors of the importance of manpower and manpower costs in the economy, and particularly of qualificational aspects. It has also been reinforced by the growth of productivity bargaining, of government sponsored Industry Training Boards, and recently by deliberate economic pressures to obtain manpower economy and productivity.

2. Britain tends to be in a strong position in the development of and interest in manpower planning. On the theoretical side we have leading work going on at the Universities of Kent, Cambridge, Liverpool and Ulster (Professors Bartholomew, Stone and Young) and at L.S.E. (Manpower and Higher Education Research Units) and Sussex, where the Institute of Manpower Studies is located. We have also seen the establishment of the Manpower Society as a forum for those professionally interested in this

subject. The frontiers of knowledge are being extended in the fields of dynamics modelling and forecasting, of manpower economics, and of operational applications within firms and institutions. Within government we have strong manpower planning or manpower economics teams within the Civil Service Department, the Department of Trade and Industry, and Department of Education and Science, the Department of Employment and the Ministry of Defence. Within industry there are some leading pioneers in the application of mathematical/operational techniques to manpower problems, not just in newer industries such as chemicals, oil and automobiles but also in more traditional ones such as coal and steel where some of the most challenging problems occur. Finally, it is of interest to note the high proportion of the growing literature that is of British origin.

3. In the systems field there are a number of examples of sophisticated and successful applications. Much of the pioneering had been done by large private firms who have been learning how to use the computer successfully for manpower purposes, and, as elsewhere, by Defence agencies too. In particular the R.A.F.'s integrated pay and personnel system is among the best of its kind in the world. The new individual student record system of the Department of Education and Science is of great potential influence and its work in the statistical and economic approach to qualified manpower has developed enormously in the past decade. In the same area the Department of Trade and Industry has been developing a highly sophisticated classification system for the measurement of professional manpower and its utilisation in the economy, with extensibility to the white and-blue collar labour force. The Department of Employment has developed for its domestic purposes in Employment Exchanges a very detailed classification system and occupational dictionary analagous to the American D.O.T. * system and with a similar I.S.C.O. ancestry and approach.

Above all in importance, perhaps, is the comprehensive and highly sophisticated system being constructed by the Civil Service Department - the personnel management and manpower planning department, among its other functions, for the whole of the British Civil Service. It is the subject of one of the case studies in this report. This integrated pay/personnel/planning system will cover

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* D.O.T. = Dictionary of Occupational Titles.
I.S.C.O. = International Standard Classification of Occupations.

some 500,000 Government employees at managerial, professional and clerical level and is being introduced in two main phases during this present decade. Apart from the technical fascination of its unique design and operational aspects it should provide an extremely powerful managerial tool both for career and organisational development and for manpower planning. It should be of widespread interest and value to other Civil Services for domestic reasons and it is likely to provide a stimulating model and proving-ground for manpower specialists and for large employing firms and institutions world-wide.

Thus the British scene has some splendid highlights. If the rest of this paper appears to dwell on some of the shadows as well, it is only to attempt to illuminate and perhaps share with others some of the problems inevitably encountered in an era of rapid change and adjustment and in a field of knowledge and experience in which much has yet to be learned.

MANPOWER INFORMATION NEEDS AT THE NATIONAL LEVEL

We see in the industrialised countries:

a. increasing social/economic complexity and integration of information needs.

b. new computing technology.

c. accelerating changes in the economy and in society, including employment patterns and occupational and educational mix.

These require a more systematic and concerted approach at macro levels to acquiring, analysing and publishing information about manpower in the economy and indeed about the population as a whole. Governments and enterprises increasingly need recent, accurate and statistically compatible data for inter-connected planning and decision-making, and present piecemeal approaches no longer serve. Together a,b,and c above make it less possible to allow parallel information systems about different aspects of manpower to grow independently, and changing or improving them becomes increasingly difficult and costly. There is thus an increasing need for their conscious planning and integration in advance, with inbuilt capacity for adaptation and growth.

There are three layers of need:

1. Macro-International
2. Macro-National; Government
3. Macro-Micro; National and International Enterprises and Institutions.

The meat in the sandwich is no. 2 - if this can be got right the others will broadly come into line since they are dependent and follow from it.

One cannot plan 1 then 2 then 3, nor the reverse. Government statistical systems are thus the focul point for action. 1,2 and 3 do not need to be the same, but must be broadly compatible. Within 2, different departments need to have close inter-compatibility. If the design and principles of Government systems meet national needs (which are very similar, essentially, across frontiers) the rest will gradually follow and input and output to and from each will adapt to a simpler and more satisfactory pattern.

Note that some people have suggested that since ultimately Government is dependent for almost all its data on flows of information from micro-levels, the design of any national system should follow from the preliminary establishment of complete uniformity of classification within firms and institutions. This is then extended by others to argue that a unified national system is utopian, since uniformity will never become possible at micro levels. However, this is a non-problem. Firms and institutions, being at the informational grass-roots, can submit data vertically upwards in any reasonable form demanded by a common macro-system without thereby requiring to have a common horizontal system at their own level. There is much unnecessary confusion about compatibility.

A macro system needs to be so far as possible designed as a whole, or if not the departmental elements must have close compatibility, i.e. describing their own elements of manpower information in common assumptions and terms (e.g. all using the same age-bands, occupational and industrial classifications, etc.) The resulting structure will then have broad coherence and consistency, but with facility for separate or additional detail to be inserted as required by individual departments, and with adaptability built in. Thus it would be multi-purpose in approach (with specialised requirements met by sampling and ad-hoc surveys).

One would visualise a broad common statistical base for at least:

Population Census Office
Manpower and Placement and Earnings Surveys
Educational Sector, and Qualified Manpower
Social Security
Professional and Employer Institutions, Trade Unions, Universities, Vocational Training Agencies, etc. at macro-level.

The content and design needs to be as simple as possible consistent with essential minimum requirements at macro level. As a maximum these might be expected to be:-

Industry Classification and Location (Sector, establishment - location),
Occupational Classification, i.e. Job Function or what is done in the job.
Role, i.e. Job Authority (e.g. Manager, Supervisor, Trainee, etc.)
Qualification (Academic, Professional), by LEVEL and FIELD.

Such axes can in practice measure characteristics of both people and jobs, thus preserving simplicity and economy. Where not otherwise obtainable there would have to be provision for personal information on a defined basis i.e. sex, age, income, etc. The Occupational Classification would almost certainly need to comprehend:

1. Broad socio-economic or skill-level occupational groupings: managerial/professional/technician/ clerical, manual/service, and non-active (e.g. housewife, schoolchild, retired).

2. Sub-divisions by sets of similar occupational contents or "job-families".

3. Provision for key individual occupations by title (e.g. for earnings surveys).

It would need to be designed to cross-refer to the national industry classification, each then enhancing the informational content of the other and simplifying the content and structure of the Occupational Classification itself.

It is important to recognise, however, that while a multi-axis and multi-purpose approach is probably easier in practice and in the long run for suppliers of data, and certainly simpler and more powerful for the purposes of computing and statistical analysis, it may cause fears and opposition by appearing more complicated and demanding at first sight than in fact it is. Any coherent and systematic approach is better than none. It would seem better and more politic to start with a very simple framework as a foundation - probably a basic occupational classification plus some agreed conventions on the treatment of age bands, etc. - in the hope that other statistical series would then in time organically graft themselves on as logical coaxial elements under the pressure of commonly perceived real needs, rather than to assay a highly rational but overcomplex structure attempting to meet all needs at once. What is essential to pursue is compatability of elements rather than formal integration, and it would be naive to suppose that a rational analysis of national requirements would automatically ensure agreement between Government departments or between these and industry. Given the complexity of society there is clearly no ideal system and no likelihood of perfect agreement. Sheer utilitarian pressures will increasingly push in the right direction, however.

In this connection, it would seem vital in any national or international examination of these problems to stress the unified nature of the field of enquiry - it is no good looking at it from the view point of one function of Government or of one sector of the economy alone, even though such may be a starting-off point: it concerns a fundamental aspect of sophisticated societies and of modern Government. One may agree on the need for de-centralisation and peripheral initiative and for less Government intervention, but where executive decision is necessary it is essential that it be informed decision, and taken on the basis of accurate and agreed data. The problem is compounded when, as in the U.K., there are a number of mature but independent departmental systems dealing with manpower information.

Since all governments in highly industrialised societies have broadly similar needs and there are a definite and in fact quite small number of characteristics of people in general and employees and jobs in particular that we all need to collect statistics about, one might hope that gradually several, given the means of getting together on common problems, might finish up with similar approaches. This would seem a desirable thing, particularly in the Common Market. It is not easy to get agreement to a common departmental approach even in one country, but one would hope that the opportunity to see the extent of common needs and common problems internationally would help to crystalise thinking among Civil Servants along these lines.

Thus we need for many national purposes a common occupational language - a vocabulary and a grammar, i.e. a dictionary of agreed occupational titles with definitions/descriptions, and an agreed classificatory framework. This should be capable of being used in common both by Government Departments and agencies and by macro-level institutions such as Training Boards, universities, unions, and industrial and professional associations. The advantages of such a common-factor approach need not be laboured, but the corrolary is that it must be simple, flexible, and designed for statistical applications and computerised processing. It must also endure, for statistical continuity is vital and fundamental change difficult once many users are involved.

It follows that a number of characteristics of people and of jobs must be classified for many purposes, and particularly for the more complex occupations and applications.

Apart from educational supply and demand, there is the general supply-demand position in the labour market and its relation to such factors as location and housing, wastage, occupational earnings, economic/industry sector, etc. There is the whole complex question of the utilisation and productivity of manpower, requiring occupational and functional analyses and econometric approaches (e.g. the multi-axial coding of the "L.S.E.* Study of Manpower and Economic Performance in the Electrical Engineering Industry," and Denis Pym's study of professional manpower utilisation). Utilisation is particularly important since it seems likely that substitutability and flexibility of deployment of elements within the labour force have probably been the saving grace in difficult supply-demand situations and poor forecasting, and are frequently underestimated. Simple total stocks by industry-sector would seem quite insufficient as a basis for econometric studies designed to improve knowledge of and control over the interactions of manpower and other factors in the economy. Michael Hall has suggested that the U.K. has an inbuilt tendency towards an economy of low wages and low labour intensity due to consistent overestimating of labour productivity and underestimating of capital productivity, due largely to poor data. Great difficulty has been experienced in measuring the effects for good or ill of Selective Employment Tax. Training Boards need accurate information about manpower to gauge training and development needs and estimate costs and returns on training.

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* London School of Economics.

Such examples are taken at random: they are sufficient to illustrate the need for more and better - organised and co-ordinated data nationally. This need will grow. It does not imply more government interference with industry. Better data and feed back should result in more sophisticated and accurate and remote control of the economy than the often clumsy ad hoc interventions at low level which we have too often experienced.

Stafford Beer has much to say of relevance in "Decision and Control". He points out that Governments cannot govern without receipt of information about how the populace, both as citizens and institutionally, is behaving, and that Government is analogous to control through informational feed back circuits. Lead-time in Government response is dangerously increased if the information is badly organised for processing and analysis, and in this connection information-based "industries" such as ministries and financial institutions will get no-where by making machines duplicate previous manual systems - appropriate system-structure is essential.

However, as already mentioned, probably the biggest single obstacle to progress in the general application of manpower statistics to national needs and purposes is the lack of a common approach to occupational classification in its broad utilisational connotation.Qualified manpower will be highlighted here because of its importance and because the problems associated with classification, analysis and forecasting are particularly complex, but other aspects would equally have served and at whatever manpower application one looks in the U.K., the same factor arises of the lack of a common classificatory language for manpower. Experience suggests that this situation is prevalent world-wide.

Certainly in the U.K. we have as yet no common classification covering the primary and ancillary occupational axes. We have several specialised classifications and several proposals for a national system which are the subject of hot discussion and disagreement. Interest has strongly developed since 1965 when Michael Hall, at the time Head of Recruitment and Manpower Planning in Esso Petroleum Co. Ltd., began to campaign for a National Manpower Grid, or manpower information system, to be based on a standardised classification.

It is no doubt symptomatic of the underlying need that between 1965 and 1969 no less than five major proposals should have developed for a national system of manpower classification. These are :-

CODOT - Department of Employment
KEY LIST OF OCCUPATIONS - D. of E. (essentially a similar CODOT)
INSTITUTE OF MANPOWER STUDIES PROPOSAL (Maurice Farrand)
DEPARTMENT OF TRADE & INDUSTRY (MINTECH) SYSTEM (Mrs. Joan Cox).
SCOPE - STANDARD CLASSIFICATION OF OCCUPATIONS AND POPULATIONS IN THE ECONOMY ("Proposals for Revising the Draft Key List of Occupations" Anton Hersleb, for C.B.I., C.I.A. & PEACER)

Of these, the first two employ "single-axis" (in reality mixed or integrated axis) designs while the latter three are multi-axial.

Underlying such design considerations are a few very fundamental points:

1. The data which such macro-systems use as input is held at the micro-level in a multi-axis fashion, particularly for professional and managerial manpower which will continue to grow as an element in the workforce, and even in small and simple employing organisations.

2. Human beings are multi-axial systems in such of their characteristics as concern employers and government.

3. The human brain thinks multi-axially in that it categorises and models the environment with which it interacts, and thinks in terms of pattern.

These would suggest that a multi-axis solution is essential for the classification and counting of manpower and job characteristics. However, multi-axis systems tend to mirror the very complexities of the realities they attempt to measure and may thus be impracticable or at least unpopular and expensive unless very carefully and elegantly designed with priority to practical considerations.

There is strong disagreement among interested parties in the U.K. on this question of the axial design of classificatory systems for manpower and jobs and the related issues of the scope and organisation of the axial contents and the interrelation of occupational and industrial classification systems. The issue is basically that of economy and simplicity (single and integrated axes) versus accuracy and analytical facility (multi-axis). One suspects that the pressure of events and of national needs will ultimately resolve this controversy. Meanwhile the evident need for a single multi-application national system grows stronger year by year and the present multiplicity of proposals is symptomatic of an unsatisfactory situation.

MULTIPLICITY OF APPROACHES TO MANPOWER DATA AND SYSTEMS: THE BASIC BRITISH PROBLEM

Britain has a wealth of statistics related to human beings in the economy. Some of the series are of long standing, but there has been a proliferation in the past decade, both of extensions and refinements in existing statistical areas and of special studies by official commissions and committees and by institutions such as universities and professional and industry associations. Growth and new departures have been most marked in the areas of education, of qualified manpower, and of labour-market information.

There is thus a wealth of material, but its use and further development in a systematic and co-ordinated manner is difficult because :-

a) nationally there is much more information available on the supply than on the demand side, which is weak.

b) data has originated from different sources using different methodologies and in particular poorly-compatible classifications.

c) there is considerable autonomy among both Government departments and other institutions at the macro level, and their approaches are still ill-co-ordinated, though progress is being made in spite of the practical difficulties attending greater integration.

d) ultimate suppliers of information are irritated in consequence by varying and incompatible and thus work-generating demands for data from a multiplicity of departments and institutions. This breeds resentment, indifference and lack of confidence. Many suppliers do not have the sophistication or resources required. The climate of opinion has also hardened regarding the implications of better Government information systems in terms of possible greater future intervention and centralisation i.e. there is growing resistance to this through fear of abuse or ill-considered applications.

e) fundamental to all else, and generating much of the difficulties encountered, is the lack of a common national system of occupational classification and of compatibility within and between enterprise and public authority systems; yet each depend upon improved flows of manpower information between the two. We have as yet no nationally-accepted common occupational language.

There is now much more awareness of these problems than even a few years ago. It is the long-term policy of the Central Statistical Office to achieve greater integration of information systems and statistics concerning people both in the economic and social aspects, and reference should be made to Professor Moser's valuable summary of these aims and the associated difficulties in "Social Trends NO. 1" (HMSO* 1970), a collection of material which refreshingly emphasises both the importance of trends and the inter-departmental nature of manpower information and policy.

The problems involved are daunting. One should emphasise particularly the importance and interrelationships of the educational and labour market-aspects, and the need for a linkage between them horizontally and between the macro and micro sectors vertically through a common classificational language to describe people, particularly people organised for work, and jobs.

PROBLEMS ASSOCIATED WITH THE EDUCATION SYSTEM AND WITH THE QUALIFIED MANPOWER POPULATION IN THE U.K.

Because of its cost and the great importance of its output to economic growth and change and to society as a whole, information about the educational sector is a fundamental need of government.

The British background is one of a tremendous expansion in education since the war as a national commitment. This has led to an increase in the annual supply, but also to demand for a high proportion of the output (and of an appropriate mix within it) from the educational sector itself - a process feeding upon itself in a spiralling fashion limited only by the availability from Government of capital input. There have been parallel but smaller increases in demand from the expansion of the Civil Service, from the relatively high proportion of national resources devoted to Research and Development, and from the much increased acceptability of graduates as recruits to industry and commerce.

The fundamental point to grasp, which underlies the whole British approach in the higher education and qualified manpower sectors, is concerned with the difficulties with the supply/demand equation, and underlying this again is the lack of information and methodology for measuring, classifying and forecasting utilisation of and demand for the higher educational output.

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*Her Magesty's Stationery Office

Thus the committee which drew up the Robbins Report- which is the foundation stone of present higher education policy and planning, discovered that though they could get some measure of supply, in practice there was effectively none with credibility on the demand side. Such difficulties led to their basic conclusions, in being called upon in effect to size future national investment in higher education, that :

a) " - although we have not made national need the main basis of our estimate, this must not suggest that we have any doubt of the value to the country of a greatly increased stock of highly educated people."

b) " - while it is possible for a number of professions and over a short term, to calculate with a fair degree of precision what the national need for recruits will be, we have found no reliable basis for reckoning the totality of such needs over a long term."

c) The committee recognised the need for rigorous investigation in future of the demand side. Higher education must, however, be sized upon likely demand for places (i.e. supply) This would provide "a sounder basis for estimates." It thus followed that:

d) " - courses of higher education should be available for all those qualified by ability and attainment to pursue them and who wish to do so." (actually a fixed and constant proportion of these was specified).

Thus Robbins laid down an open-ended "social demand" approach which has in principle been national policy ever since, and in which response to demand on the input side, and thus supply, is limited only by the proportion of national resources that the taxpayers (among whom parents form a large percentage) are willing to devote to the satisfaction of social demands. The size and mix of the resulting supply are thus presently determined by :

a) the size of the school population and the proportion thereof with suitable entry qualifications wishing to enter higher education, less wastage in the latter process, and

b) the disciplinary predelictions of such entrants, as conditined by school subject mix, by the school-teaching profession, by teenage climate of opinion about society and employment, by course availability in practice, by the system of grants for students and for institutions, and by the demand-pressures of higher education's own manpower requirements.

Since Robbins there has been great improvement in the flow of information and forecasts on the supply side, less so on the demand side. There are excellent projections of school numbers and flows plus school leaver surveys from which are derived projections of teacher supply and demand and of flows into employment and higher education and thus finally of higher educational output by discipline. This latter could still be improved, in that data on student wastage and on course-substitution is still not satisfactory, and the equation of teacher supply-and-demand and knowledge of teacher-utilisation could be more rigorous. Current estimates of the shortage of mathematics teachers, for example still vary by several orders of magnitude.

What is still more unsatisfactory is knowledge and prediction on the demand side and of the relation between the educational system and the labour market, though some progress has been made. A series of surveys and commissions since Robbins has examined stocks, deployment and flows of educated manpower, with particular emphasis on scientists and technologists (a good deal less is known about other disciplines and occupations). Various aspects have been examined in depth by e.g. the Committee on Scientific Manpower, the Jackson, Swann, Jones, Dainton, Tood etc. Committees. There have been regular Triennial Surveys on stocks of scientists in employment, vacancies, and demand for three years ahead, extended later to cover engineers and technologists and subsequently technicians. The University Grants Committee furnishes regular statistics of the student population, of degrees awarded, and of the first employment of graduates. similar statistics are provided for other higher educational institutions by the Council for National Academic Awards. The Census since 1961 and particularly since the 1966 Sample Census has included a number of questions on both occupations and higher qualifications, with a secondary sample following the 1966 Census correlating higher education with income. More recently the Departments of Education and Science and of Trade and Industry have been developing the provision of relevant statistics from professional bodies who award qualifications (an important source of qualified manpower in the U.K.), with most emphasis to date on science and technology.

The Department of Trade and Industry in particular has developed a system of manpower and job classification and counting which has been employed in part for the Triennial Surveys of Qualified Manpower and which is being proposed as a multi-purpose national system.

This arose from four needs :-

1. An internal Personnel/Planning system for D.T.I. employees.

2. Information on manpower in advanced - technology and particularly Research and Development Sectors and Establishments of interest to the Department.

3. Qualified Manpower in the Economy in general.

4. A perceived need for a national manpower classification.

It is a complex and sophisticated multi-axial system which is already in operation under 1. and 2 above, and its Qualificational Axes are in operation under 3 in association with the Department of Education and Science.

Thus we know a great deal more about the supply, stocks, deployment, flows and demand situation in the area of qualified manpower than we did ten or even five years ago, but the resulting knowledge of the present is still far from satisfactory and the problems involved in demand forecasting are formidable. Not least of the drawbacks is a) the time-lag involved in publishing data (though modern data processing methods should begin to show an improvement) and b) the necessarily slow lead-time or response-rate for changes in the educational system to take effect. Thus the information and control feed-back loop in the educational sector has inherent problems.

The present period in our history would seem an opportune time to take stock of the supply-demand situation and higher educational policies and plans. The assumption of Robbins in the early 1960's have already been undermined on the supply side by much larger numbers of school leavers acquiring the necessary entrance qualifications than have been predicted - a trend that seems likely to continue. The resulting higher education expansion has been brisk and has absorbed much of the accelerated supply by generating its own pattern and volume of demand. We are now in a pause before the next phase of expansion, and reappraisal of previous assumptions may be in order. The pause has reduced demand from the higher educational sector. This has coincided with a general worsening of the labour market and there is a sudden surplus of graduates and a measure of redundancy affecting managerial and professional as well as other grades, leading to a new interest in the view that an open-ended "social demand" policy may not be reconcilable with Britain's economic prospects or perhaps with social equilibrium.

Some of the assumptions and forecasts on the demand side are also increasingly challenged. We have had in the outcome no disastrous shortages of scientists and technologists or teachers or technicians, and the Brain Drain has not embarrassed us. Though the proportion of school output opting to read science or technology is not particular satisfactory, the size of the overall supply has resulted in an adequate response to the actual demand as it developed for such disciplines (although it is frequently alleged that many science and technology places have only been filled by lowering entry standards).

Thus while supply forecasting has not been unqualified success, demand forecasting has been notably unreliable, and there is no consistent guarantee of planned interaction and integration between the two sides of the equation. Insofar as we can reasonably know of the demand side, as a nation we may appear to be investing in higher education somewhat extravagantly and in inappropriate directions. It is a measure of the imperfections of supply/demand information, and in particular of hard information on the utilisation and economics of well-educated people, that it is difficult to affirm or deny such assertions, but certainly they are symptomatic of unease at the present situation.

At lower levels, important trends seem to be developing in the decline of the school leaver as a source of manpower above the technician level and in the small incremental cost in the U.K. of employing graduates rather than technicians up to the age of about 35. Other trends involve increases in low-skill clerical jobs, their concentration in data-processing facilities in cities and the increasing commitment of such people to values other than work, with consequent effects on the labour market, wastage-rates, absence costs, transportation etc. Another development is the likely overlapping phasing of the impact of automation, computerisation, cost reduction and productivity improvement successively on blue collar workers from the 1950's and 60's, on white collar workers from the 1960's and 70's, and on professional and managerial workers in the 1970's and 80's. Another is the imperfect response of the labour market to classical economic supply and demand pressures, and the coincidence of inflation and unemployment.

All these demand investigation and more sophisticated forecasting methods if we are to control our future better and cope with potential social tensions, instabilities in the labour market, and diseconomies and dislocations in the educational system which is the life-blood of our industrial civilisation. We need to formulate and solve our supply/demand equations better than we have done if we are to improve the design of education for national purposes and get the best return from the high proportion of our national investment that it represents.

OTHER MACRO-LEVEL ASPECTS IN THE U.K.

At this level a number of Government departments have data systems incorporating manpower aspects of one kind or another. Some of these are essentially domestic or specialised to one purpose, e.g. national insurance, health, revenue, etc.; others have wider implications. The Census, of course, of the Office of Population Censuses and Surveys, is fundamental. It employes a primarily socioeconomic classification with occupational elements and, naturally, a number of "personnel" axes. Its disadvantages lie in the wide gaps in the time-series and the self-recording basis of its occupational data. It is improving all the time from a manpower viewpoint (not least in reduced processing time) and in particular from the 1961 Census onward has been devoting attention to qualifications within the population (with a supplementary cross-check on income in 1966).

The wealth of educational data collected by the Department of Education and Science has already been commented on, as have the activities of the Department of Trade and Industry (Mintech) in connection with measuring the stocks and distribution of qualified manpower in the economy.

It should be mentioned that the Department of Trade and Industry also collect data on manpower stocks by the Standard Industrial Classification codings for industry sectors, and the Department of Employment also do a certain amount of manpower analysis by Industry Sector. The Standard Industrial Classification would seem not well suited to the collection of manpower information: it is primarily designed for the classification of enterprises and institutions. The counting is by the "output" of the manpower in each "establishment" by majority. Thus a majority engaged in production will swing the coding of the whole establishment to manufacturing, and information on other organisation or occupation functions such as accounting, transport etc. is submerged. Further, since the relationship of "establishment" (i.e. in general a workplace with geographical boundaries not crossing a public thoroughfare - though the definition is in practice complex) to organisation and function will vary from firm to firm, there must be dubious consistency of treatment. Again, the coding has no place for an accounting department of an enterprise - only for accounting firms and partnerships as such. To be a useful tool for manpower analysis either the classification's structure needs amending to include Organisation Function (which it now reflects rather imperfectly at the first digit, and in any case there are problems in counting manpower by organisation function which may not be immediately apparent - see the author's "Classification and Counting of Manpower") or for manpower information purposes some occupational data needs to be combined with manpower counts by Standard Industrial Classification. This latter would seem the preferable route.

It should be added that the rules for levying and rebating Selective Employment Tax are based on "establishments" and Industry codings. They are too complex to describe here, but their effect is frequently to alter the original Industry codes of establishments in order to meet the underlying intentions of Parliament. This cannot help the realism or accuracy of national manpower statistics.

The Department of Employment now conducts an annual Census of Employment, also based on Industry codes by "establishment", but obtains occupational information on a sample basis. Further, it conducts Earnings

Surveys on an occupational basis, using up to now a rather ad hoc occupational listing with a simple structure developed and amended in consultation with industry. Occupational data on registered unemployed, vacancies, and placements is also collected and published.

For its own domestic purposes the Employment Service had for many years used an occupational classification primarily based on an industrial rather than a work-content basis. This had become increasingly inconvenient and out of date, and in the mid-sixties work began on CODOT (Classification of Occupations and Dictionary of Occupational Titles). This has strong affinities both with I.S.C.O. and the American D.O.T. system. CODOT is more comprehensive than the former and is probably easier to use than the latter's complex occupational structure and its classification of levels of mental, social and physical skills (data, people, things). CODOT was at one time conceived by the Department of Employment as a possible basis for an occupational classification for use across the economy, but following strenuous objections from a number of quarters on various grounds (principally on design considerations and the complexity and length of the coding structure), it is now confirmed that it will be used for domestic purposes only within the Department, although it is available for the domestic purposes of firms who may wish to make use of it. Employment Exchange personnel are to receive detailed training in its use. One of its most welcome features is its foundation: a most comprehensive and painstaking collection of job descriptions - the Dictionary aspect. These provide a reference source and building bricks for almost any macro or micro occupational purpose or structures. CODOT's own structure is that of a "mixed-axis" design, or "tree structure", classifying occupations by 18 Major Groups and then by Minor and Unit Groups and sub-groups over a total of ultimately seven digit-spaces for employment purposes (less for statistical purposes). It is extremely comprehensive. Its Employment Exchange applications originally caused it to be somewhat ill-balanced as between manual and other occupations. This has now been corrected and its structure provides for analyses at various levels of aggregation. It is not perhaps the easiest of systems to use and like D.O.T. will probably require fairly elaborate cross-reference and indexing machines.

The Department of Employment are well aware of the need for a national statistical system covering occupational information, and towards the end of 1969 their Director of Statistics put forward a fresh proposal in the form of a Key List of Occupations. This draft Key List proposal is based on a comparatively short list of benchmark occupational titles selected by frequency of use and by population size, originally for the purpose of earnings comparisons. It is arranged to follow CODOT's tree structure and 18 primary divisions at the first two digits. It is thus readily compatible with CODOT and it should not prove too difficult to adapt the present national Census classification to the Key List without much loss of statistical continuity.

The Key List originated from various occupational lists used in Department of Employment earnings surveys. It is deliberately designed to be as simple as possible, and is confined to Key occupations and classification by job content. It will have "not elsewhere classified" slots into which many occupations will be coded in an undifferentiated manner. It is so simple that it could conceivably be structured as an alphabetical list, or allotted codes 0 - 999 in sequence. In fact, however, it has a simple tree - structure and has inherited CODOT's 18 Major Groups and will probably only use three digits for coding.

The Key List has been the subject of most intensive consultations both between Ministries and between the Department of Employment and employers' and industry associations, Industry Training Boards, other institutions, and private firms and individuals. As a result, while it would be true to say that there have been misgivings and even strong opposition expressed, on the whole the Key List concept appears widely acceptable as an improvement over the present unsatisfactory situation and as a first-generation and lowest-common-denominator approach. Any proposed national system covering several purposes must fail to some extent to satisfy all parties. There are real difficulties in meeting the needs of different branches of government. Some industries wanted a broader treatment, others wanted more detail. The Oil and Chemical industries in particular, from their own experience and detailed concern with manpower efficiency and quality, felt that only a true multi-axial design approach (separating role and skill from occupation per se) would be flexible and penetrating enough to meet the various needs encountered at government, intermediate and micro levels, and feared (and still fear) that the Key List design would rapidly become obsolete. The majorty opinion was, however, that this latter point of view probably underestimated the difficulties of introducing a multi-axial approach at this time, particularly so far as smaller firms were concerned.

To be fair to the Key List design, it stressed that it is not being introduced as a fully comprehensive multi-purpose national system of occupational classification and statistics, as such (and it will thus not satisfy those who believe that Britain needs this now). It is intended as a practical means of providing some useful and badly - needed improvements as rapidly as possible and meeting rather more modest but essential objectives and applications in a pragmatic manner. These are :

1. Common occupational classification and thus compatible data for :-

    a) national population census.

b) occupational distributions in manufacturing industry (it is to be hoped that this would be widened to include all economic activities).

c) unemployment and vacancy statistics.

d) national earnings surveys (and basis for detailed industry surveys).

e) Industrial Training Boards' uses.

2. Preservation of simplicity and statistical continuity while improving standardisation and compatibility of occupational statistics.

3. Individual identification of only the most essential and/or numerous occupations as ascertained by consultation and statistical analysis of existing data, the remainder grouped under "other" in each occupational "family" (18 such "families" following CODOT's structure).

4. While recognising the analytical advantages of multi-axial structure the Department of Employment feel that in practice much information of value about role and skill can be identified and extracted from Key List data.

It is perhaps only right to mention here the author's own conviction that a proper multi-axial approach is better, and his public opposition both to CODOT and to the Key List when they were originally proposed as a basis for national manpower statistics. He would have liked to see the Key List - while retaining its essential simplicity given some provision for identifying non-economic occupations, provided with a separate simple role/authority axis (including a code-value for trainees),and subjected to a re-arrangement of occupational "families" to group them by broad skill levels. These were essentially his SCOPE proposals for improving the Key List approach and represent in its opinion the maximum level of design complexity tolerable in a British application at this time, and the minimum amount of information in a form needed for a really useful national system of manpower statistics.

Nevertheless the Key List in an improved version is now being adopted and must be accepted as a working compromise for our immediate needs. As such it must now be supported as a long-needed and essential statistical tool which must at least improve the present unsatisfactory situation, give invaluable additional information, clean-up some present statistical incompatibilities, reduce to some extent the burden on suppliers of data to government, and which will at least be simple and readily understandable from the users' viewpoint. As such it may be expected to gain widespread acceptance, to be useful in improving understanding of manpower prblems, and should serve well within its own objectives as a first-generation approach. In the longer-term, perhaps, it could be visualised as the basis of a Job Function axis in a truly multi-purpose system of manpower statistics. In the meantime a number of problems are left unresolved and there are particular difficulties in certain areas such as qualified manpower.

Nevertheless, despite the perhaps rather limited national needs being met and the reservations on certain points of a number of manpower specialists including the author, the Department of Employment must be congratulated on producing in CODOT and the Key List a substantial and valuable improvement in the U.K.'s statistical resources.

INTERMEDIATE AND MICRO-LEVEL ASPECTS

At the level between Government and the firm one finds a mixed situation. On the one hand, with the help and encouragement of the Department of Education and Science and that of Trade and Industry (formerly Mintech) and the Burnham Committee, professional institutions and Training Boards have now found some order in the jungle of British qualifications and we have a more or less common national qualificational language. On the other hand, with the institution of Training Boards following the Industrial Training Act of 1964, confusion in the classification of manpower has become compounded. The new Boards had to obtain a quick picture of the manpower situation in their industries and could not wait for a national system. All sorts of different approaches have been set up, and one of the original hopes - that the Boards would become the co-ordinating channel for all manpower data to Government departments - seems far off. The danger is that such systems will become institutionalised to the point where remedial action across industries becomes very difficult.

The experience of the petroleum industry in this connection may be of interest. Statistics on manpower in the industry issued by different Government departments were all wildly at variance and nearly all suspected to be wrong. It was determined therefore by the Petroleum Industry Training Board to set up a manpower classification and take an industry-wide census. In the event the recommendations of the advisory group of oil company manpower experts, representing 80% of the industry's manpower, were ignored, and a mixed-axis occupational approach based on CODOT adopted instead. We now have an accurate figure for the total industry manpower by region and by the main organisational functions, and some good data on manual occupations. However, the data for managerial, professional and support occupations which form so substantial and important a proportion of the petroleum industry is in many respects interesting but not very useful, even for training purposes. For example, it is impossible to derive numbers by level of qualification across all functions, or to separate technicians from technologists and scientists or to get an accurate picture of computing resources or laboratory manpower - all matters of every-day importance to oil companies. If this could happen in an industry which is accustomed to a highly sophisticated approach towards its human resources one wonders about the quality of manpower data available to some other Boards, and the opportunities missed of valuable interfirm and industry comparisons and the development of manning standards as a stimulus to productivity and cost reduction.

At the micro level we have various classifications developed in private firms. The introduction of the computer has needless to say greatly proliferated such systems in middle and large size firms and institutions, including systems for the upper echelons of the Civil Service and for the Armed Forces/Defence Sector. Note than an integrated system with multi-axial occupational components will be in operation for the whole of the Civil Service before the end of this decade.

Some firms have separate payroll and personnel systems, some ignore manpower planning as such, and some have fully-integrated information and planning systems. However, the nature of manpower and of the organisation of human affairs is such that personnel systems at this level are all multi-axial in a true sense. They have to take account of such aspects of human beings as age, sex, marital status, address, ability rating, compensation, qualifications and education etc. and of such aspects of organised work as physical and organisational location, organisation title and function, job title and function, grade or pay rate, etc. Even very small firms who have no systematic or conscious approach to such problems have in practice to think and to keep at least rudimentary records in terms of some of these axes.

It is this that gives one some hope for ultimate agreement on a truly national multipurpose system. It is this wealth of data at the grassroots on which government and higher institutions must depend, and although firms and institutions will differ in their organisations, methods, products, occupational mix etc., there is a fairly limited number of data categories of national interest and importance, and which are common to most human beings and most work places, and on which data is collected and held in roughly similar ways from a classification viewpoint.

CONCLUSIONS

To summarise:

1. Britain needs better data, better organised for better use at macro and micro level and for greater economy of input effort. The advent of the computer and the development of knowledge about manpower information systems has made this very feasible, and a lot of activity is now going on in this direction.

2. Better information systems are very necessary for effective government, as control theory confirms. This does not mean more government, but better government, (in spite of employers' fears based on past experience, and of a charged political climate). Thus fewer but better controls result from better - organised information (as is the case in business management) and should result in less but more effective intervention in the economy especially at enterprise levels.

3. Such progress depends to a large extent on systems design and especially classification design. Multi-axis designs would seem to be better because they suit statistical analysis and data processing and because manpower systems have to describe multi-axis systems - men - working within multi-axis systems - organisations and the economy. Most data at the input end is also organised multi-axially. Success depends on maintaining simplicity, economy and acceptability while meeting essential needs only: otherwise a simple listing is better.

4. Given better data, classifications, and systems we can begin to achieve better forecasting methods. These are essential if Britain is to equate her resources with her needs to the best national advantage and to gain a stronger control over her future. Educational supply and demand is an important example.

5. There are crying needs for better information and forecasting in many areas at national and enterprise level; examples are: econometric modelling and the development of knowledge in the area of manpower economics, training and development needs, manpower utilisation and productivity measurements, the development of industry/firm comparisons and manning standards, rapid changes in the labour market caused by economic and technological factors, social and job mobility, etc. etc.

For all these reasons OECD's Manpower and Social Affairs Committee must be congratulated on organising Working Parties and Meetings to exchange information and ideas and stimulate progress in this important area of knowledge and activiites. It is essential that such progress be made, not only for governments but for institutions and enterprises, and not least for private citizens at the receiving - end of administration, management and taxation.

It is satisfying to be able to report quickening interest and progress in so many respects in the U.K.; it is hoped that there is something to interest most practitioners in this field in other countries.

ANNEX III

LIST OF PARTICIPATING COMPANIES

Appendix I - Phase I participants
Appendix II - Phase II participants

APPLICATION OF EDP IN PERSONNEL MANAGEMENT

LIST OF COMPANIES PARTICIPATING IN .ART I OF STUDY

AUSTRIA

1. Chemiefaser Lenzing A.G.
2. IBM Austria
3. Oesterreichische Philips Industrie Ges. M.b.H.
4. Schoeller Bleckmann Stahlwerke A.G.

FRANCE

5. Compagnie Air France
6. Commissariat a l'Energie Atomique
7. Credit Lyonnais
8. Electricite de France - Gaz de France
9. Lesieur Cotelle S.A. France
10. Societe de gestion Shell
11. Societe Nationale d'Etude et de Construction de Moteur d'Aviation (SNECMA)

GERMANY

12. Allianz Versicherungs A.G.
13. Continental Gummi-Werke A.G.
14. Deutsche Lufthansa A.G.
15. Esso A.G.
16. Farbenwerke Bayer A.G.
17. Ford-Werke A.G.
18. Hamburgische Elektricitaetswerke A.G.
19. IBM Germany
20. Siemens A.G. Berlin/Muenchen
21. Stahlweek Suedwestfalen A.G.

SWEDEN

22. DATEMA AB
23. L.M. Ericsson AB
24. SAAB Scania AB
25. Skandiakoncernen
26. Graenges Oxeloesungs Jaernwerk

SWITZERLAND

27. Lonza Ltd.
28. Maggi A.G.
29. Swissair Luftverkehrs A.G.

UNITED KINGDOM

30. British Railways Board
31. Central Electricity Generating Board,London
32. Civil Service Department
33. Esso Petroleum Co. Ltd.
34. Ford Motor Co. Dagenham
35. ICL United Kingdom
36. IBM United Kingdom Ltd.
37. National Coal Board (Non-Manual Employees)
38. National Coal Board (Manual employees)

APPENDIX II

LIST OF COMPANIES

PARTICIPATING - PHASE II

AUSTRIA - Oestrerreichische Philips Industrie
Ges. M.b.H.

FRANCE - Credit Lyonnais

GERMANY - Ford - Werke A.G.
Hamburgische Elektricitaetswerke A.G.
Siemens A.G.

SWEDEN - SAAB Scania A.B.

UNITED KINGDOM - Esso Petroleum Company Limited
Civil Service Department

ANNEX IV

LIST OF ORIGINAL EXPERTS GROUP

List of Members of the Steering Group
for the study on
LABOUR MARKET IMPLICATIONS OF EXTENDED APPLICATION OF ELECTRONIC DATA PROCESSING IN PERSONNEL WORK

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